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Summaries of all articles in four languages

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Original Articles

The Radicability of Methods to Eliminate Colostomy: A Critical Review*

HARRY E. BACON, M.D., F.A.C.S., F.I.C.S. AND ROBERT J. ROWE, M.D.
PHILADELPHIA, PENNSYLVANIA

IN Europe, an abdominal colostomy is not and never has been acceptable, as disclosed by personal interviews with Seneque of Paris and Louschy of Luxembourg and published reports by Hochenegg, Kraske, Kirschner, Schmeiden, Mandl and d'Allaines, as well as numerous others. In this country, the frequent and often unnecessary establishment of a permanent stoma as an integral part of resection has prompted surgeons to ascertain whether procedures designed to eliminate colostomy, as advocated by Babcock, Berg, Wangensteen and Dixon, are justified. Criticism from advocates of the principles laid down by Miles has been vigorous, and such is commendable until evidence is available to show that the performance of such procedures do not alter our objective in the treatment of cancer, namely, complete eradication of the disease.

It is our purpose to consider impartially phases pertinent to "proctosigmoidectomy" as suggested by Babcock in 1932. The questions arise: (1) Does preservation of the sphincter musculature compromise radicability? (2) How does the radicability of "proctosigmoidectomy" compare with other procedures? and (3) What are the comparative survival rates of cure?

In respect to the first question, the histopathologic evidence of retrograde flow in carcinoma is of vital import. Perhaps it would not be amiss to bring to date our knowledge of the subject and to employ direct quotations rather than literal interpretations.

As early as 1897 Waldeyer called attention to the facility with which epithelial cells spread in reverse direction to the lymph stream, while von Recklinghausen described a direct reversal of the lymph stream in a case of cancerous obstruction of the thoracic duct. Miles in 1923 contended that cancer extends in three directions, previously described as the "zones of spread," offering evidence, in support of his operation "abdominoperineal excision," that the incidence of recurrence could be greatly diminished by wide surgical extirpation including contiguous gland-bearing tissues. His method was immediately accepted and since then has been practiced successfully in all parts of the civilized world. Westhues of Erlangen, however, in 1934 published a noteworthy treatise which should be read in the original German or at least in an accurate translation by those interested in malignancy of the lower bowel. His sincerity of purpose is clearly portrayed in the following sentence: "From the huge mass of individual studies . . . every possibility of error must be excluded. When, for example, on the basis of my studies I make the statement that rectal carcinoma never metastasizes into the analward situated lymph nodes, one can see to what consequences an error in the study could lead." His investigations confirmed the work of Staemmler and Fischer, that rectal carcinoma has a strikingly small tendency toward lateral spread in the bowel wall layers, especially upward or downward. To quote: "Regional metastases lie only at the level of or above the carcinoma itself, practically exclusively in the neighborhood of the superior hemorrhoidal vessels and and its branches . . . that these local metastases are situated up to 12 cm. above the carcinoma . . . below the carcinoma the perirectal and retrorectal tissue is always free of metastasis. Hence in the radical operation it is necessary to remove the perirectal and retrorectal fatty and connective tissue at the level of the carcinoma itself and above this for 12 cm. Below the carcinoma, not only

* Read before the Second Southern Assembly, United States Chapter, International College of Surgeons, Feb. 28, 1947, Tampa, Fla.

the bowel but also the corresponding connective tissue can be left without danger of recurrence." He further remarks, "It can be absolutely established that the bowel is healthy 1 to 1½ cm. below the carcinoma; hence the resection line can be set unhesitatingly 2 to 3 cm. from the growth." Gabriel, Dukes and Bussey, the following year, observed in their group of 100 specimens that the first glands to be affected are those in the immediate vicinity of the growth, after which a continuous spread takes place along the glands accompanying the superior hemorrhoidal vessels. "Lateral or downward lymphatic spread is found only in a late stage of the disease where the hemorrhoidal lymphatic vessels are blocked by metastasis." Gilchrist also mentions that retrograde metastasis below the tumor may occur where there is gross enlargement of high-lying nodes with lymphatic blockage. He found retrograde metastatic involvement of lymph nodes below the growth in six instances; in every case, however, the nodes central to the lesion were completely replaced by carcinoma showing marked obstruction to lymph flow and metastasis by retrograde means. Coller and his coworkers comment thus: "In no lesion of which the inferior border (of the growth) was 3 cm. or more above the mucocutaneous (pectinate or anorectal) junction did we find metastases along the lateral zone of spread. Grinnell in a series of 75 specimens cites one case in which upward, lateral and downward spread occurred from a growth located 6 cm. above the pectinate line."

Lymphatic spread downward and laterally, according to Norbury, occurs only with an advanced growth where the whole superior hemorrhoidal lymphatic path is blocked by metastasis. Quite recently, Glover and Waugh examined 100 postoperative specimens and demonstrated that even in far advanced carcinoma retrograde spread along the course of the bowel occurs to any appreciable degree only in 1 per cent. In the face of such rarity it may be justified to state that retrograde metastasis never occurs from growths still in the stage of reasonable operability. Section of the bowel must be at least 2 cm. below the lower palpable edge of the lesion to satisfy pathologic requirements. In conclusion they remark, "When these facts become more generally appreciated and the technical procedures required for such surgery are subjected to refinement, many sufferers from neoplastic lesions will enjoy a normal postoperative existence without the psychologic, to say nothing of the anatomic, detriments of a permanent artificial anus."

TABLE 1. INCIDENCE OF RETROGRADE NODAL METASTASES

Author	Specimens in Series Studies	Showing Ca.	Distance Below Lesion In Cm.
McVay	100	1	1
Wood and Wilkie	100	0	0
Westhues	74	1	1
Gabriel, Dukes and Bussey	100	2	1
Gilchrist	74	6	4
Coller *et al.*	53	1	1
Grinnell	75	1	1
Colp	18	1	3
		1	5
Glover and Waugh	100	27	0–1
		6	1–2
		1	2–3
		1	3–4
		1	6–7
Bacon	146	2	2
		1	6

Consistent with these reports, it seems appropriate to mention our experience in a group of 146 patients (Table 2) in whom the extirpated specimen of bowel was sectioned 2, 4 and 6 cm. below the lower edge of the growth. In all, an abdominoperineal proctosigmoidectomy without colostomy was performed. This operation was instituted only where the distance between the anal margin and the lower border of the growth was 6 cm. (3 cm. above anorectal line) or more. It will be noted that in Case 3, W.O., metastasis was present to a distance of 6 cm. below the growth. All superior lymphatics disclosed extensive lymph blockage. Case 20, E.V., showed invasion at 2 cm. distance below the growth.

TABLE 2. ABDOMINOPERINEAL PROCTOSIGMOIDECTOMY IN 146 CASES OF ADENOCARCINOMA

No.	Pt.	Age	Sex	Grade	Cm. Bowel Removed	Lesion Circumference	Section Below Growth in cm. 2	4	6
1.	E. McR.	63	M	II	27	Entire	0	0	0 C
2.	F. W.	62	F	II	25	1/4	0	0	0 C
3.	W. O.	52	M	II	31	Entire	+	+	+ C
4.	G. S.	55	M	III	26	Entire	0	0	0 C
5.	T. D.	55	M	III	25	Entire	0	0	0 C
6.	P. C.	39	M	II	43	1/2	0	0	0 C
7.	E. R.	42	F	II	19	3/4	0	0	0 C
8.	M. B.	66	M	II	22	Entire	0	0	0 C
9.	S. L.	65	F	II	13	Entire	0	0	0 C
10.	D. C.	36	F	II	24	Entire	0	0	0 C
11.	P. G.	57	M	II	22	Entire	0	0	0 C
12.	J. K.	58	M	III	31	Entire	0	0	0 C
13.	S. A.	42	F	II	24	1/4	0	0	0 –
14.	J. P.	52	F	II	10	1/8	0	0	0 –
15.	J. R.	60	F	II	31	Entire	0	0	0 C
16.	F. A.	58	M	II	19	Entire	0	0	0 C
17.	M. D.	49	M	III	22	1/8	0	0	0 C
18.	E. H.	74	F	III	30	Entire	0	0	0 B
19.	E. S.	64	M	IV	37	3/4	0	0	0 C
20.	E. V.	58	F	III	19	Entire	+	0	0 C
21.	A. R.	72	F	II	28	3/4	0	0	0 C
22.	E. H.	57	M	II	29	3/4	0	0	0 B
23.	B. W.	38	M	III	21	3/4	0	0	0 C
24.	L. W.	39	F	II	26	1/4	0	0	0 C
25.	H. K.	62	F	II	36	Entire	0	0	0 B
26.	B. O.	40	F	II	24	Entire	0	0	0 C
27.	C. T.	58	M	I	25	1/2	0	0	0 –
28.	J. B.	44	M	II	19	Entire	0	0	0 C
29.	E. S.	72	M	II	21	Entire	0	0	0 C
30.	R. B.	58	M	II	20	Entire	0	0	0 C
31.	M. P.	65	F	II	26	Entire	0	0	0 C
32.	A. K.	57	F	II	21	3/4	0	0	0 C
33.	V. C.	60	M	II	19	3/4	0	0	0 C
34.	C. B.	68	M	II	21	Entire	0	0	0 C
35.	S. B.	56	M	II	24	Entire	0	0	0 C
36.	V. L.	56	M	II	16	Entire	0	0	0 B
37.	G. G.	61	M	III	37	Entire	0	0	0 B
38.	J. F.	45	F	II	33	Entire	0	0	0 B
39.	M. R.	59	F	II	20	1/2	0	0	0 C
40.	A. V.	64	F	II	22	3/4	0	0	0 B
41.	P. G.	41	F	III	14	Entire	0	0	0 C
42.	G. McF.	73	M	II	27	3/4	0	0	0 B
43.	L. K.	35	F	II	22	3/4	0	0	0 B
44.	W. G.	66	M	II	24	3/4	0	0	0 A
45.	J. C.	55	M	II	28	Entire	0	0	0 B
46.	W. H.	41	M	II	17	3/4	0	0	0 B
47.	A. DeG.	68	M	II	40	Entire	0	0	0 B
48.	A. K.	55	M	III	22	3/4	0	0	0 C
49.	H. T.	32	F	II	28	Entire	0	0	0 B
50.	H. T.	32	F	II	36	1/2	0	0	0 B

TABLE 2. ABDOMINOPERINEAL PROCTOSIGMOIDECTOMY IN 146 CASES OF ADENOCARCINOMA—*Continued*

No.	Pt.	Age	Sex	Grade	Cm. Bowel Removed	Lesion Circumference	Section Growth Below in cm. 2	4	6
51.	F. B.	47	F	III	32	3/4	0	0	0 C
52.	T. D.	56	M	II	26	Entire	0	0	0 C
53.	L. M.	42	M	II	29	Entire	0	0	0 B
54.	M. H.	62	F	N.G.*	27	1/4	0	0	0 B
55.	C. M.	49	M	III	41	1/2	0	0	0 B
56.	N. M.	35	F	IV	35	Entire	0	0	0 C
57.	J. D.	53	M	II	31	1/2	0	0	0 C
58.	E. C.	59	F	II	32	1/2	0	0	0 B
59.	C. R.	58	F	III	42	Entire	0	0	0 B
60.	A. D.	73	F	II	30	1/2	0	0	0 C
61.	B. C.	34	F	II	41	1/2	0	0	0 B
62.	H. R.	53	M	II	32	Entire	0	0	0 B
63.	M. M.	62	F	I	25	1/4	0	0	0 B
64.	A. D.	69	F	II	22	1/4	0	0	0 B
65.	J. A.	66	M	II		1/4			
66.	E. C.	56	F	II	31	3/4	0	0	0 B
67.	S. S.	40	F	II	32	Entire	0	0	0 B
68.	E. W.	56	M	II	42	3/4	0	0	0 B
69.	M. H.	62	F	II	29	1/4	0	0	0 B
70.	B. C.	53	F	II	28	Entire	0	0	0 B
71.	T. O.	50	M	II	28	Entire	0	0	0 B
72.	J. DeP.	60	M	II	54	Entire	0	0	0 B
73.	W. J.	35	M	I	92	1/5	0	0	0 A
74.	A. K.	70	F	II	26	1/2	0	0	0 B
75.	K. C.	34	F	II	18	Entire	0	0	0 B
76.	C. W.	71	F	II	26	1/2	0	0	0 B
77.	F. G.	38	F	II	28	1/2	0	0	0 B
78.	N. G.	61	F	III	20	1/4	0	0	0 C
79.	M. T.	49	F	II	32	1/2	0	0	0 C
80.	M. S.	37	F	II	38	1/4	0	0	0 C
81.	A. K.	58	F	II	26	1/4	0	0	0 A
82.	I. B.	54	M	I	42	1/5	0	0	0 A
83.	P. D.	50	M	III	34	Entire	0	0	0 C
84.	R. J.	55	F	II	28	Entire	0	0	0 B
85.	E. C.	56	M	II	28	3/4	0	0	0 B
86.	S. G.	50	M	III	22	Entire	0	0	0 B
87.	J. B.	63	M	III		Entire	0	0	0 C
88.	M. S.	65	M	II	38	1/4	0	0	0 B
89.	M. D.	41	M	II	33	1/4	0	0	0 B
90.	T. M.	54	M	I	26	1/4	0	0	0 A
91.	P. S.	57	M	II	32	3/4	0	0	0 C
92.	E. W.	49	F	II	27	3/4	0	0	0 B
93.	M. K.	32	F	II	30	3/4	0	0	0 B
94.	A. L.	56	M	I	34	1/2	0	0	0 B
95.	E. S.	59	M	II	23	1/2	0	0	0 A
96.	C. S.	58	M	I	26	1/4	0	0	0 A
97.	W. B.	67	M	II	28	Entire	0	0	0 C
98.	C. P.	64	F	III	24	Entire	0	0	0 B

* Not graded.

TABLE 2. ABDOMINOPERINEAL PROCTOSIGMOIDECTOMY IN 146 CASES OF ADENOCARCINOMA—*Continued*

No.	Pt.	Age	Sex	Grade	Cm. Bowel Removed	Lesion Circumference	Section Growth Below in cm. 2	4	6
99.	C. M.	51	F	II	37	3/4	0	0	0 B
100.	J. H.	67	M	II	40	Entire	0	0	0 C
101.	R. M.	60	F	II	34	Entire	0	0	0 C
102.	C. T.	56	M	II	27	Entire	0	0	0 C
103.	G. K.	62	M	II	21	3/4	0	0	0 C
104.	H. L.	55	M	II	41	3/4	0	0	0 B
105.	C. B.	32*	M	I	68	1/4	0	0	0 A
106.	A. C.	63	F	II	22	Entire	0	0	0 C
107.	J. T.	62	M	II	39	Entire	0	0	0 C
108.	B. G.	35	F	III	49	1/2	0	0	0 C
109.	H. A.	50	F	III	50	1/2	0	0	0 C
110.	L. G.	59	M	II	36	1/2	0	0	0 B
111.	E. A.	74	F	III	24	3/4	0	0	0 A
112.	G. M.	52	M	I	28	1/5	0	0	0 A
113.	A. T.	42	F	IV	38	3/4	0	0	0 C
114.	J. S.	63	M	II	34	Entire	0	0	0 C
115.	W. M.	65	M	II	26	1/2	0	0	0 B
116.	W. M.	47	M	II	29	1/2	0	0	0 B
117.	R. B.	48	M	I		1/4	0	0	0 A
118.	S. K.	58	M	II	36	Entire	0	0	0 B
119.	R. D.	51	M	II	52	Entire	0	0	0 C
120.	C. M.	78	F	I	22	1/4	0	0	0 A
121.	M. R.	59	F	II	27	1/4	0	0	0 B
122.	J. C.	61	M	II	22	1/2	0	0	0 A
123.	Q. G.	60	M	I	41	Entire	0	0	0 A
124.	C. T.	58	M	II	27	1/2	0	0	0 A
125.	I. S.	57	M	I		1/4	0	0	0 A
126.	L. W.	59	F	II	27	3/4	0	0	0 B
127.	E. V.	72	F	II	22	Entire	0	0	0 B
128.	A. R.	58	F	II	24	Entire	0	0	0 C
129.	E. A.	42	F	II	64	1/2	0	0	0 B
130.	A. B.	63	F	II	29	1/4	0	0	0
131.	C. H.	36	M	II	26	1/4	0	0	0 B
132.	D. P.	68	M	II	30	Entire	0	0	0 B
133.	N. H.	46	F	II	26	3/4	0	0	0 B
134.	G. B.	63	M	III	63	Entire	0	0	0 B
135.	L. S.	66	F	II	27	1/4	0	0	0 B
136.	M. K.	59	M	II	36	Entire	0	0	0 B
137.	J. O.	70	M	II	34	3/4	0	0	0 B
138.	J. A.	47	M	I	—	1/4	0	0	0 A
139.	M. W.	60	F	II	37	Entire	0	0	0 B
140.	E. L.	52	F	III	31	Entire	0	0	0 C
141.	M. B.	57	F	II	62	3/4	0	0	0 B
142.	E. C.	66	F	II	29	Entire	0	0	0 C
143.	M. K.	58	M	II	34	0	0	0	0 B
144.	G. S.	54	M	II	34	Entire	0	0	0 B
145.	A. G.	54	M	II	38	1/5	0	0	0 A
146.	L. C.	57	F	II	36	1/4	0	0	0 A

* Polyposis.

If it be permissible to draw conclusions relevant to the investigations mentioned, the authors' inclination would be to concur with Grinnell in that "it seems evident that downward spread is of little importance except in advanced cases which are probably already inoperable because of extension along the main lymphatic route upward." Such may be regarded as evidence that preservation of the sphincter musculature does not compromise radicability.

In answer to the second question, How does the radicability of proctosigmoidectomy compare with other procedures, and does the procedure permit wide surgical removal of the gland-bearing areas?, one must be mindful that the employment of any method, independent of type, may be performed radically or conservatively according to the individual surgeon. This fact is clearly evidenced by the variations of technic in the performance of the customary Mikulicz procedure. Abdominoperineal proctosigmoidectomy as it should be performed, calls for and permits of wide excision of the mesosigmoid, wide removal of the adjacent pelvic peritoneum, wide removal of the perirectal tissues and gland-bearing areas and wide excision of the levators. It has been reported that the usual point of ligation in performing the perineoabdominal (Gabriel) or abdominoperineal excision (Miles) is 10 in. (25 cm.) from the tip of the coccyx; in proctosigmoidectomy the point of ligation has averaged between 38 and 55 cm. Such high point of ligation permits additional removal of mesosigmoid. In the Miles operation, customarily the average surgeon will divide the peritoneum conservatively in each gutter and especially in the pelvis close to the bowel for the purpose of later establishing a diaphragm; in proctosigmoidectomy greater removal is permitted since no complete floor is made. By the same token some report utilization of the iliac sigmoid as a midline colostomy in order to extend the radicability of the Miles procedure; in proctosigmoidectomy mobilization of this portion of the bowel (iliac sigmoid) is made routinely.

The next question concerns the survival rate in terms of five-year cures following proctosigmoidectomy compared to other methods. It should be mentioned that Eiselsberg of Vienna, Sauerbruch of Munich, Payr of Leipzig, Mandl of Jerusalem, Gulede of Jena and Kirschner of Tübingen have reported a higher rate of three- and five-year cures where the muscles were not sacrificed. Similar published articles are to be found by Eichoff and Pribram.

Only a small number of our patients can be evaluated for the period over five years, but of those it will be observed that the rate compares very favorably when one considers the percentage of resectability, the rate of mortality, and the fact that resection was instituted for palliation as well as for cure. By employing the method suggested by Newman of the British Ministry of Health and by Dukes, the five year survival rate is computed from the customary fraction:

$$\frac{\text{alive at 5 years} \times 100}{\text{resection deaths, less those untraced and died of other causes}}$$

Of the 77 patients resected more than five years ago 52.6 per cent are living and well.

It is interesting to note that the records of these 77 patients showed that the histopathologic reports in 20 instances conformed to Grade A (mural penetration), as suggested by Dukes. Of this number, 4 were Grade I and 15 were Grade II (1 was ungraded).

Available reports by various authors employing other methods where colostomy is established without preservation of sphincter muscle are appended in Table 4.

Very few reports include ten-year survival rates.

One frequently inquires, "does proctosigmoidectomy with preservation of the sphincter musculature augment the operative mortality?" A review of the published reports on methods of resection for rectal growths in which the sphincters are retained, shows that the operative mortality compares favorably with the amputative types where a colostomy is an integral part.

TABLE 3. PERCENTAGE OF FIVE-YEAR SURVIVALS CONFORMING TO GRADE A

No. Cases	Died from Operation	Died Under 5 Years		Untraced	Alive at 5 Years	Percentage of 5 Year Cures
		Of Other Causes	Of Cancer			
20	1	2	1	2	14	93.3%

TABLE 4.

Author	Year Reported	No. Cases Resected	(Per Cent) Resectability	(Per Cent) Mortality Rate	Percentage Survivals 5 Years or More	Based on No. Cases
Rankin	1933	300	50–68	7.7	38	?
Lockhart-Mummery	1934	340		8.0	52	95
Jones, T.	1935	127	79	11.0	52	?
Raiford	1935	117	63.5	23.2	36	16
Abel	1935	...	...	...	58.3	70
Jones, D. F.	1936	463		17.1	55.5	?
Brindley	1937	76	52.4	3.9	63	?
Gabriel	1937	100		22	52	?
Miles	1939	?	65	17.0	73	94
Hayden	1945	131	91.2	10.6	33	32
Pfeiffer	1941	82	59	12.8	45	...
Cattell	1943	162	81.4	10.7	53.6	140
Lahey	1939	...	88	10	42	...
Daniels	1945	...	80	?	36	?
Dixon	1944	...	...	...	44–53	...
Gabriel-Dukes	1944	514		15	44.9	...

TABLE 5. TEN YEAR SURVIVAL RATE

Name	Year	No. Cases	Operation	Resect-ability Rate	Mortality Rate	Survival Rate Ten Years	Based on No. Cases
Rankin	1933	300	Colostomy and Resection	58–68%	7.7%	24.1	?
Babcock and Bacon	1942	414	Abdomino-perineal Proctosig-moidectomy	93%	6.6%	18	144

Aside from the reports listed in Tables 4 and 5, others are appended as follows.

To May, 1947, one of us (H.E.B.) has performed 145 consecutive resections of all types without a single death. At the present writing proctosigmoidectomy has been carried out in 407 patients for various conditions as shown in Table 8.

Following proctosigmoidectomy, patients usually are permitted out of bed on the fourth or fifth day, and most have been discharged on the tenth or eleventh postoperative day. A recent survey of 120 consecutive patients undergoing proctosigmoidectomy shows that the average stay in bed was 6.6 days, and the average period of hospitalization after operation was 13.4 days.

It is worthy of mention that the presacral wound requires less than three weeks for complete healing and closure. Thus most of our

TABLE 6. RADICAL OPERATION WITH ABDOMINAL COLOSTOMY (OPERATIVE MORTALITY)

Name	Year Reported	No. Cases	Mortality Rate
Shedden	1942	166	9.6
Besser	1945	348	22.2
Cane	1944	84	29
Sugarbaker	1946	147	14
Berger	1944	30	18.5
Zinninger	1943	220	10.2
Romano and Trackten-berg	1943	45	40
Scarborough	1939	95	9.09
Binkley	1942	128	7.8
Fansler	1944	100	5.5
Baker	1944	67	4.4
Mayo, C. W.	1942	179	8.5
Mayo, C. W.	1943	276	6.15
Singleton	1943	46	4.3
Jones, T.	1943	600	7.2
Miles	1933		17
David and Gilchrist	1942	277	7.2
Murdock	1942	87	9.2
Coller and Ransom	1944	285	8.9

TABLE 7. RADICAL RESECTION WITHOUT COLOSTOMY WITH PRESERVATION OF SPHINCTER MUSCULATURE

	Year	Cases	Resectability Rate	Mortality Rate
Hochenegg	1909	320	...	13.7
Kuttner	1928	...	37	16.4
Sauerbruch	1928	...	...	23
Graser	1928	...	53	5.8
Kirschner	1932	122	53	27
Passler	1935	67	44	35
Dietrich	1928	364	64.3	19.5
Payr	1934	...	43	10
Finsterer	1942	388	84	12
Oppolzer and Nitsche	1942	63	60.9	6.3
Babcock and Bacon	1943	414	93	{6.6 / 4.0*}
Babcock	1945	98	97	4.08
Mandl	1946	...	66.7	6.6
Murray	1946	15	...	6.6
D'Allaines	1946	116	80	6.8
Ballivet	1946	25	84	7
Bacon	1947	304	80.1	4.9

* Perineal.

TABLE 8. ABDOMINOPERINEAL PROCTO-SIGMOIDECTOMY

	Cases	Deaths	Mortality Rate
For cancer	376	18	4.9%
For inflammatory strictures	22	0	0
For diverticulitis	3	0	0
For rectosigmoid endometrioma	2	0	0
For procidentia	1	0	0
For kraurosis ani	1	0	0
For benign lymphoma	1	0	0
For megarectum	1	1	100.0%
	407	19	4.6%

TABLE 9.*

No.	Pt.	Age	Sex	Day Out of Bed	Day Discharged After Resection
1.	M.B.	66	M	7	12
2.	T.D.	55	M	6	12
3.	M.L.	59	M	7	12
4.	G.M.	55	M	6	17
5.	J.B.	48	M	8	11
6.	E.O.	64	M	7	12
7.	J.W.	57	M	7	16
8.	E.D.	59	F	6	12
9.	P.K.	55	M	6	12
10.	L.M.	72	M	8	14
11.	L.R.	52	M	8	14
12.	D.M.	69	F	6	14
13.	F.W.	62	F	6	11
14.	E.McR.	63	M	6	12
15.	A.S.	70	F	6	11
16.	P.C.	39	M	6	11
17.	E.R.	42	F	6	15
18.	W.O.	52	M	6	12
19.	T.C.	38	M	8	13
20.	T.F.	69	M	8	15
21.	A.R.	72	F	7	14
22.	E.N.	38	F	10	14
23.	E.K.	68	F	9	12
24.	E.E.	51	F	13	19
25.	J.M.	63	M	8	13
26.	B.M.	52	F	9	13
27.	M.L.	32	F	9	12
28.	F.T.	52	M	8	13
29.	G.W.	60	M	9	15
30.	C.B.	54	M	10	17
31.	A.H.	62	F	9	15
32.	R.F.	52	F	11	21
33.	G.B.	56	F	10	18
34.	C.R.	44	M	9	12

* All these are cases of carcinoma.

TABLE 9—Continued.

No.	Pt.	Age	Sex	Day Out of Bed	Day Discharged After Resection
35.	S.P.	55	M	8	12
36.	M.M.	29	F	8	11
37.	V.P.	58	F	10	16
38.	H.S.	51	M	8	15
39.	A.H.	64	M	9	19
40.	M.M.	62	M	7	12
41.	M.T.	46	F	7	18
42.	A.S.	70	F	9	20
43.	G.W.	70	M	9	22
44.	A.V.	64	F	6	11
45.	J.C.	55	M	6	11
46.	M.R.	52	F	6	11
47.	S.K.	58	M	6	12
48.	A.McF	73	M	9	18
49.	S.S.	64	F	6	11
50.	W.H.	41	M	6	11
51.	W.G.	66	M	6	12
52.	L.K.	35	F	6	11
53.	L.L.	41	F	6	11
54.	H.T.	32	F	6	11
55.	A.DeG.	68	M	9	19
56.	J.F.	45	F	6	11
57.	G.G.	61	F	6	12
58.	C.B.	61	M	16	30
59.	A.K.	57	F	6	12
60.	W.J.	35	M	7	11
61.	R.B.	58	M	6	11
62.	J.H.	56	F	7	15
63.	H.T.	32	F	6	11
64.	J.D.	55	M	6	11
65.	W.H.	41	M	6	11
66.	S.S.	64	F	6	11
67.	L.M.	42	M	6	11
68.	L.R.	49	F	6	12
69.	G.C.	65	F	6	24
70.	F.S.	53	F	6	10
71.	L.C.	57	F	6	11
72.	F.H.	69	M	5	11
73.	A.T.	66	F	6	11
74.	M.S.	54	M	6	11
75.	C.D.	29	M	6	11
76.	A.B.	72	M	6	11
77.	C.H.	36	M	6	13
78.	N.H.	46	F	5	11
79.	A.T.	42	F	5	11
80.	J.O.	70	M	5	12
81.	M.K.	59	M	5	11
82.	M.W.	60	F	6	14
83.	E.L.	52	F	7	13
84.	E.C.	68	F	4	11
85.	M.K.	58	M	6	18
86.	A.G.	54	M	5	11

TABLE 9—Continued.

No.	Pt.	Age	Sex	Day Out of Bed	Day Discharged After Resection
87.	G.K.	62	M	5	11
88.	M.H.	67	F	6	11
89.	B.C.	34	F	6	11
90.	H.R.	52	M	6	11
91.	M.M.	62	F	6	12
92.	J.A.	66	M	6	11
93.	H.L.	55	M	6	11
94.	C.B.	32	M	6	13
95.	H.A.	50	F	6	11
96.	B.G.	35	M	6	11
97.	D.P.	69	M	6	12
98.	G.B.	62	M	6	18
99.	L.S.	66	F	6	11
100.	C.S.	58	M	5	14
101.	C.T.	56	M	6	12
102.	E.C.	40	M	5	11
103.	W.M.	65	M	5	11
104.	J.H.	67	M	5	17
105.	C.M.	51	F	6	18
106.	C.R.	54	M	5	10
107.	A.C.	63	F	5	11
108.	I.D.	49	M	6	11
109.	E.C.	56	M	6	15
110.	R.J.	58	M	10	35
111.	M.S.	65	M	6	13
112.	M.D.	41	M	5	14
113.	T.M.	54	M	5	11
114.	M.K.	35	F	5	11
115.	E.S.	59	M	5	11
116.	M.F.	57	F	6	13
117.	K.C.*	34	F	6	12
118.	R.B.	39	M	6	11
119.	J.C.	55	M	6	11
120.	S.K.	58	M	6	11

* Complicated by 3 months pregnancy.

patients were able to return to their former or perhaps lighter occupations in an average of six to 10 weeks following operation. In our other type of abdominoperineal extirpation, in which a large perineal wound is made, at least three months was the average period required for healing.

SUMMARY AND CONCLUSIONS

From the foregoing, it is deemed pertinent to draw the following conclusions:

1. Preservation of the sphincter musculature does not compromise radicability provided specific principles are carefully adhered to.

2. The radicability of proctosigmoidectomy compares favorably with other procedures and in some respects permits of even wider excision.

3. The survival rate of five and 10-year cures is equal to and in some instances betters the results following the abdominoperineal excision of Miles or the perineoabdominal excision of Gabriel. This is true especially when the rate of resectability is considered. A survival rate of 52.6 per cent for five-year cure is reported; the survival rate for Grade A growths is 93.3 per cent for five years.

4. Proctosigmoidectomy with preservation of the sphincter musculature does not augment the operative mortality; for cancer our mortality rate is 4.9 per cent as based on 376 cases.

5. The morbidity, immediate and remote, is in no way compromised. A consecutive group is reported in which the average stay in bed was 6.6 days, and the average hospital stay after operation was 13.4 days.

SOMMAIRE

La préservation de la musculature sphinctérienne ne compromet pas la radicabilité, pourvu que les principes fondamentaux de la technique opératoire soient observées.

La radicabilité de la proctosigmoïdectomie compare favorablement d'autres procédés et sur certains rapports permet une excision plus étendue.

La survivance de 5 a 10 ans égale et dans certains cas donne de meilleurs résultats que l'excision abdominopérineale de Miles ou l'excision périneoabdominale de Gabriel. Cela est surtout le cas quand on considère l'étendue de la resectabilité. Une survivance de 5 ans pour 52.6% est rapportée. Dans les cas de tumeur de grade "A", on a obtenu une survivance de 5 ans dans 93.3% des cas.

La proctosigmoïdectomie avec préservation de la musculature sphinctérienne n'augmente pas la mortalite opératoire; pour les cancers, notre mortalité est de 4.9% (304 cas).

La morbidité immédiate et eloignée n'est nullement affectée. Un groupe est rapporté dans lequel les malades furent alités une moyenne de 6.6 jours. Le séjour moyen à l'hopital fut de 13.4 jours.

SUMARIO

La preservacion de los esfincteres del ano no comprometen las procedimientos quirurjicos radicales siempre y cuando el cirujano se adhiera a ciertos principios especificos.

La proctosigmoidectomia radical compara favorablemente con otros procedimientos y en ciertos respectos permite una mayor excision.

El porcentaje de los que sobreviven de 5 a 10 anos es igual y en ciertos casos los resultados son superiores a los obtenidos con la excision abdomino-perineal de Miles o con el procedimiento de Gabriel. Esto es mas notable cuando se considera el porcentaje de resectabilidad.

La proctosigmoidectomia con preservacion de la musculatura esfincterica no augmenta la mortalidad quirurjica. En nuestros casos de cancer la mortalidad en 304 casos fue de 4.9%.

La morbilidad inmediata y tardia no se ha comprometido. Se reporta un grupo consecutivo de casos en los cuales la estada en cama tuvo un averaje de 6.6 dias y la hospitalizacion post-operatoria fue de 13.4 dias.

RIASSUNTO

La conservazione dello sfintere rettale non compromette la possibilita' di un' operazione radicale, il chirurgo rispetti alcuni principi fondamentali.

La proctosigmoidectomia consente un' escisione radicale—sotto certi rispetti—maggiore degli altri metodi operatori.

La percentuale di sopravvivenza da 5 a 10 anni e' equivalente, se non maggiore, di quella successiva all'escisione addominoperineale secondo il metodo di Miles o l'escisione perineoaddominale di Gabriel.

La percentuale di sopravvivenza riportata dall'A. arriva al 52.6% (dopo 5 anni): per i casi del gruppo A la percentuale raggiunge il 93.3%.

La conservazione dello sfintere non eleva la percentuale della mortalita' operatoria. Sopra 304 casi questa si limita al 4.9%.

Anche la morbilita', immediata e remota, non e' accresciuta. La degenza a letto e'—in media—di 6 giorni: l'ospedelizzazione dopo l'operazione e' di 13.4 giorni.

The Treatment of Metastatic Cancer in Cervical Lymph Nodes*†

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THE treatment of "a lump in the neck" can be one of the most perplexing problems that confronts the physician. Not infrequently the lump in the neck is treated with negligence because so many individuals, at one time or another, have, or have had, a benign "lump in the neck." As a result, the importance of a lump is frequently disregarded or dismissed without concern by both the laity and the medical profession. We, as physicians, must constantly alert ourselves to the possibility that an enlarged cervical lymph node, in the absence of any other subjective symptoms, may be the first intimation of a cancer elsewhere in the body. It is imperative, therefore, that we expend every effort to prove or disprove the presence of cancer in any "lump in the neck," especially when found in the adult.

I do not know the frequency of benign enlarged palpable lymph nodes in the neck, and I know of no reference in the literature that could accurately give us this information. The significance of proved cervical metastases from a malignant neoplasm, however, has received considerable study.

At Temple University Hospital Tumor Clinic from 1940 to 1944 inclusive, a total of 1290 malignant neoplasms of various anatomic regions was observed and studied. Of this total, 175, or 13.5 per cent, presented cervical metastases on admission. An analysis of the origin and incidence of these cervical metastases is shown in Table 1.

TABLE 1. ANALYSIS OF THE INCIDENCE AND ORIGIN OF CERVICAL METASTASES IN 175 PATIENTS *

Larynx	24	Esophagus	4
Hodgkin's disease	24	Reticulum cell sarcoma	4
Piriform sinus	17	Skin	3
Breast	10	Oropharynx	3
Tonsil	9	Epiglottis	3
Nasopharynx and paranasal sinuses	8	Myelogenous leukemia	3
Lymphatic leukemia	8	Buccal mucosa	2
Tongue	7	Thyroid	2
Lymphosarcoma	7	Carotid body	2
Primary undetermined	7	Palate	2
Lung	6	Gingiva	2
Lymphoblastoma	5	Nasal cavity	1
Floor of mouth	5	Hypopharynx	1
Lip	5	Reticuloendotheliosis	1
Total			175

* From 1940 to 1944 inclusive, a total of 1290 malignant neoplasms was observed and studied at Temple University Hospital Tumor Clinic. Of this total, 175, or 13.5 per cent, had cervical metastases on admission.

Fifty-three per cent of the metastases were associated with tumors of the head and neck regions, 30 per cent with lymphoblastomas, 6 per cent in advanced breast cancer, 3 per cent in lung cancer and 2 per cent each in cancer of the skin and cancer of the esophagus. In 4 per cent the primary lesion was not discovered.

Martin [6] recently tabulated the location of the primary lesion in 500 consecutive cases of cervical metastases from cancer of the head and neck regions observed at Memorial Hospital (Table 3). The four most common sites

* From the Tumor Clinic, Department of Surgery and the Department of Roentgen and Radium Therapy, Temple University Hospital, Philadelphia, Pennsylvania.
† Read before the Twelfth National Assembly, United States Chapter, International College of Surgeons, Chicago, Sept. 29–Oct. 4, 1947.

TABLE 2. REGIONAL AND DISEASE ORIGIN OF CERVICAL METASTASES.

Region and Disease	Cases	Per Cent
Head and Neck		
Larynx, hypopharynx 45		
Oral cavity 35		
Nasopharynx, nasal cavity and paranasal sinuses 9	93	53
Neck 4		
Lymphoblastoma	52	30
Breast	10	6
Primary undetermined	7	4
Lung	6	3
Esophagus	4	2
Skin	4	2
Total	175	100

TABLE 3. LOCATION OF PRIMARY LESION IN 500 CONSECUTIVE CASES *

	Cases	Per Cent
Tongue	127	25
Floor of mouth	44	9
Extrinsic larynx	44	9
Nasopharynx	40	8
Lip	35	7
Tonsil	34	7
Mucosa of cheek	28	6
Metastatic from undetnd. primary	28	6
Jaw	27	5
Pharyngeal wall	24	4
Palate	20	4
Skin of face	11	2
Thyroid	11	2
Miscellaneous	27	5
Total	500	100

* From Martin, H. E., Ann. Surg. 114:972, 1941.

of the primary lesion are tongue, floor of the mouth, extrinsic larynx and nasopharynx.

From these data it is obvious that a broad view of the problem of treatment of cervical metastases is necessary. We cannot treat all cervical metastases on the basis of experiences gained in the treatment of metastases from only one anatomic region. These data demonstate that all anatomic regions of the oral cavity, naso-, oro-, hypopharynx and neck are capable of metastasizing to cervical lymph nodes. The lymphatic spread varies with the anatomic location of the primary lesion, and the histology, likewise, may show great variations in the degree of malignancy, radiosensitivity and radiocurability, depending on the anatomic origin of the primary growth.

These factors, therefore, must be considered in the selection of the treatment modality of cervical metastases.

Moreland [13] states, "It has been my observation that one is less biased in one's selection of the method of treatment to be followed in a particular case when all methods are equally available and that better judgment can usually be exercised by one familiar with the various methods of treatment."

The following criteria are important considerations in the treatment of each case of cervical metastasis:

1. The cervical metastases must be demonstrated to exist not only clinically, but also histologically, by biopsy. We have found aspiration biopsy as described by Martin and Ellis [9] to be a most useful procedure in proving the presence of metastases. In cases where a negative aspiration biopsy is obtained, a surgical biopsy may be required. A negative aspiration biopsy does not rule out the presence or absence of metastases and must be completely disregarded.

2. Is the treatment for metastases on admission, i.e., at the time the patient is first seen and treatment to the primary lesion is under consideration, or is it for treatment of cervical metastasis developing at a later date and where the primary lesion has been controlled?

3. Location of primary disease.

4. Location and extent of metastases—regional, bilateral, and/or distant.

5. Degree of histologic differentiation of the individual tumor cells.

6. General physical and mental condition of the patient.

After these facts have been carefully weighed, a decision as to choice of treatment may be made so as to give the patient the maximum chance of curability. These criteria are taken into further consideration in the subsequent discussion of treatment of cervical metastases arising from the various anatomic regions.

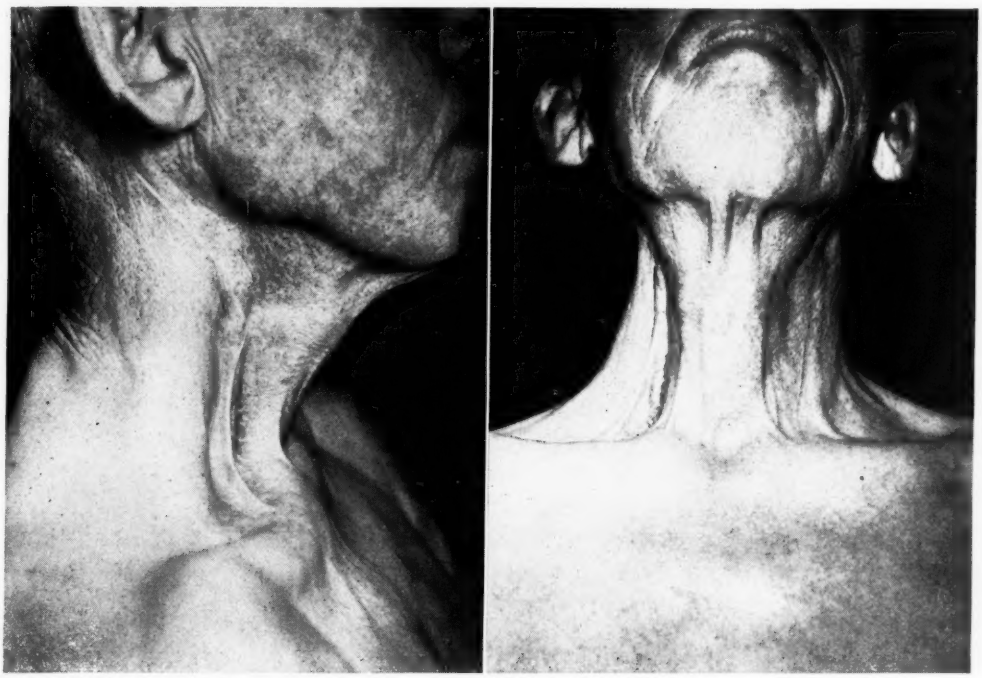


Fig. 1. F.B., male, age 64. Squamous cell carcinoma, Grade II, of the posterior third and base of the right side of the tongue. Treated by resection on Dec. 21, 1945. Cervical metastases appeared in the right upper neck region in August, 1946. A radical neck dissection was performed on Aug. 14, 1946. The photographs indicate the type of incision (left) and appearance of neck (right) on Aug. 8, 1947.

The accepted methods of treatment of cervical metastases are:

1. Surgery, either in the form of a radical or partial neck dissection.

2. Roentgen ray radiation combined with interstitial radiation.

3. Interstitial radiation by implantation of radium or radon.

4. Combinations of the above methods, that is, surgical exploration with implantation of radon, surgical excision with implantation of radon, or neck dissection with implantation of radon.

SURGICAL TREATMENT OF CERVICAL METASTASES

The scope of this paper does not permit a detailed discussion and analysis of the surgical technic which should be followed in performing radical neck dissection or the procedures of the various types of partial neck dissection.

Radical neck dissection implies the complete removal of all lymph node-bearing tissue between the superficial subcutaneous fat and the fascia covering the deep muscles of the neck. The area of the dissection extends from the lower edge of the mandible and the mastoid into the supraclavicular space and to the clavicle; posteriorly from the anterior edge of the trapezius forward to the midline. Sometimes the dissection may even extend into the superior mediastinum. Usually it entails the removal of the entire sternocleidomastoid muscle, the internal jugular vein, the submaxillary gland and any other structures that may be involved by the metastases, and partial resection or ligation of the external carotid artery.

Partial neck dissection may vary from a local submental or submaxillary triangle dis-

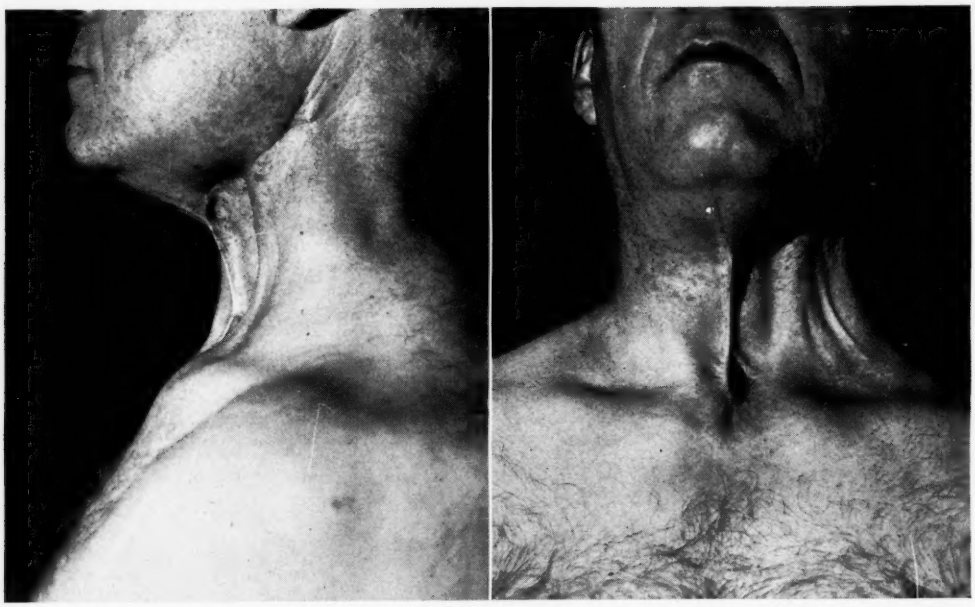


Fig. 2. F.S., squamous cell carcinoma, Grade III, of larynx with cervical metastases. With the cooperation of Dr. Chevalier L. Jackson, a combined laryngectomy and radical neck dissection was performed. The photographs show the appearance of the left neck and the laryngectomy stoma (right) after complete healing.

section to a suprahyoid or infrahyoid dissection. At our clinic, it is routine to have gold radon seeds available for all neck dissections in case the metastases are found perforating the capsule and infiltrating surrounding structures.

In the reports found in the literature the importance of local anesthesia is greatly stressed. Martin[6] lists a postoperative mortality of 1.5 per cent for local anesthesia and 14.3 per cent for general anesthesia. In 98 consecutive neck dissections performed by the author, one death occurred for a mortality rate of 1 per cent.*

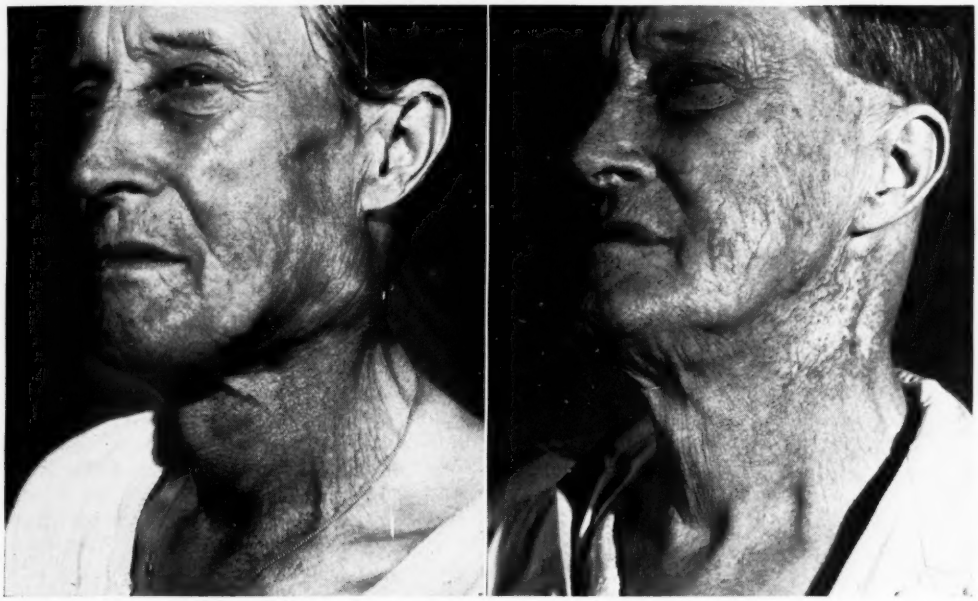
The anesthetic of choice is selected after careful consideration of the condition of the patient and the anticipated difficulties of the operative procedure. We employ the following types of anesthesia for neck dissections:

1. Local, cervical block and avertin.
2. Local, cervical block and sodium pentothal, the latter being administered only if the patient is restless and at the time of dissection around the carotid bulb. In addition, each patient is given moderate preoperative medication consisting of atropine sulfate and 50 to 100 mg. of demerol.
3. Endotracheal intubation: nitrous oxide and ether or cyclopropane and intravenous sodium pentothal. Care is observed to deliver an adequate oxygen intake at all times.

RADIATION TREATMENT OF CERVICAL METASTASES

Cervical metastases treated by external irradiation alone are only occasionally cured. Where cervical metastasis was proved histologically and was treated by roentgen ray radiation alone, it is the exceptional case that remains well five years or longer (Fig. 3). C. L. Martin and Wright[5] state, "In our opinion cervical nodes containing squamous cell carcinoma cannot be cured with external irradiation alone because the carcinolytic dose

* This patient had a radical neck dissection which required 2½ hours operating time and was performed under cervical block and local infiltration; intravenous sodium pentothal was administered at the time of dissection around the carotid bulb. He was discharged from the hospital on the eleventh postoperative day. Two days after discharge he was readmitted in a comatose condition and died the same day. An autopsy revealed marked cerebral atherosclerosis with multiple areas of encephalomalacia.



July 25, 1941 May 8, 1946

Fig. 3. W.G., male, age 68. Admitted July 23, 1941, complaining of a lump in the neck of three months' duration. History otherwise noncontributory. In the left upper neck, just below the angle of the mandible, a fixed mass, 6x4x4 cm., was noted. It was adherent to surrounding structures. A smaller node, 1 cm. in diameter, was found just below the large mass. There was no other palpable adenopathy. A thorough physical examination failed to reveal any evidence of a primary lesion. X-ray of the chest was reported normal. Aspiration biopsy of the mass in the neck showed it to be a papillary squamous cell carcinoma, Grade II. From July 29, 1941 to Aug. 31, 1941 he received 250 r daily through a 9-cm. portal directed at the metastases, for a total dose of 3500 r, measured in air. No other treatment was given. Observed at two to four-month intervals since. Last seen on Sept. 4, 1947, at which time he had been free of disease over six years and to date no primary has been found. It is possible that this patient may have had a primary squamous cell carcinoma arising in a branchiogenic cyst.

for cancer in lymph nodes is considerably larger than that required for the primary lesion." They treat metastatic cervical nodes by simultaneously administering external roentgen irradiation utilizing the so-called Coutard technic and implanting radium in layers throughout the tumor. Their results in a group of 19 proved cases are 33 per cent three-year survivals.

Richards [14] reports on a group of 119 cases with cervical metastases from cancer of the tongue treated by radiotherapy with a three-year survival rate of 40 per cent. Hayes Martin [6] has reported 46 cases living and well five years or longer with proved metastatic cancer in cervical nodes treated by a course of external irradiation, administered in fractionated daily doses over a period of two to three weeks, for a total of 4,000 r to 8,000 r, depending on the size of the portal. Immediately on completion of the external radiation, radon seeds in a tissue dose of 5 to 10 S.E.D. (skin erythema doses) are implanted either through a puncture wound in the skin or after surgical exposure of the outer surface of the node. Blady and Chamberlain [1] reported end results of radiation treatment of cancer of the larynx from 1931 to 1937, and at that time concluded that "external irradiation alone is insufficient for control of metastatic cervical disease."

At Temple University Hospital Tumor Clinic and Radiation Therapy Department, the radiation treatment of cervical metastasis is by a combination of roentgen ray radiation and interstitial implantation of radon. The

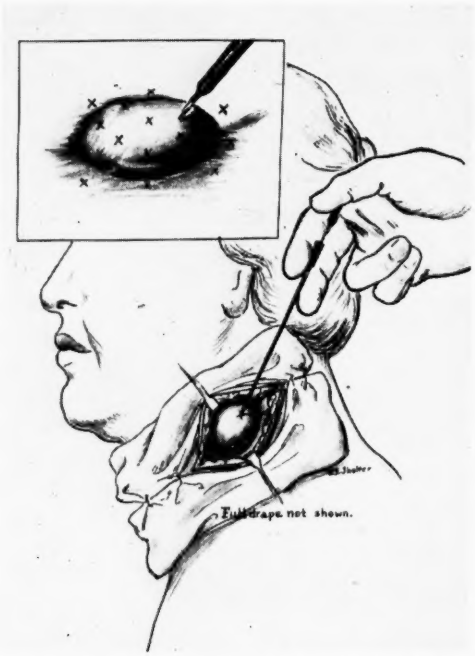


Fig. 4. Under local anesthesia the metastases in the neck are exposed and radon gold seeds are implanted as shown in the diagram (upper left). The tissue dosage is determined from Table IV.

roentgen ray radiation is given in divided doses through a portal adequate to cover the metastatic disease. The entire lymph node-bearing area of the neck is never irradiated. A tumor dose of at least 5,000 r is delivered. This is then followed by additional treatment which may be (1) implantation of radon gold seeds directly through the skin into the metastatic lymph node or nodes; (2) surgical exposure and implantation of radon gold seeds, or (3) neck dissection with or without the implantation of radon.

Whenever radon seeds are implanted into metastatic nodes as a supplemental treatment, a tissue dose of 5,000 to 10,000 gamma roentgens is delivered (Table 4). If radon gold seeds are implanted after a radical neck dissection, they are distributed regionally, and each such region is given a tissue dosage of from 5,000 to 12,000 gamma roentgens, depending on the size of the area being treated, and whether there is a possibility of disease remaining in any of the regions.

PROPHYLACTIC NECK DISSECTION AND PROPHYLACTIC IRRADIATION

Since it is difficult to determine clinically in many instances whether metastases are present or not, the proper treatment of such cases has been the subject of much controversy.

The prophylactic treatment to the neck, it must be stated, can be of actual value only in those cases admitted without palpable metastases, in which the primary lesion was eventually controlled, and in which clinically demonstrable metastases appeared at a later date.

Analyzing the five-year survival statistics of Memorial Hospital,[7] Martin points out that in cancer of the tongue 40 patients were admitted without palpable cervical metastases in whom the primary lesion was permanently controlled. Five, or 12 per cent, later developed metastases. In other words, prophylactic neck dissection or prophylactic roentgen irradiation could have been a useful procedure in this group only. It would have been unnecessary in the remaining 35 patients and, unfortunately, could not be counted on to eradicate the metastases in the five who later did develop metastases in lymph nodes.

In cancer of the lip[10] 128 patients were admitted without palpable cervical metastases in whom the primary was permanently controlled. Of this group, 4, or 3 per cent, subsequently developed cervical metastases.

In cancer of the cheek 12 patients were admitted without palpable cervical metastases in whom the primary was permanently controlled. Of this group, 2, or 17 per cent, developed cervical metastases.

The hypothetical limits of the value of prophylactic neck dissection or irradiation, therefore, are indeed very small, as is demonstrated by these figures.[7]

Taylor and Nathanson[15] reported on 247 patients with lip cancer without palpable lymph nodes, who were treated by excision of the primary lesion alone, with no primary treatment to the neck. Later, a neck dissection was carried out in 25 patients because of the development of palpable nodes. Twenty proved to be histologically positive for meta-

TABLE 4. QUANTITIES OF INTERSTITIAL RADIATION NECESSARY TO DELIVER 1000 ROENTGENS IN VARIOUS VOLUMES FILTER 0.5 MM. PT.*

Diameter of Spherical Mass: Centimeters	1	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Volume of Mass: Cubic Centimeters	0.5	2	4	8	15	25	35	50	65	90	115
Milligram or millicurie hours to deliver 1000 roentgens	35	80	135	250	330	420	540	680	830	1000	1160
Millicuries destroyed to deliver 1000 roentgens	0.25	0.6	1.0	1.9	2.5	3.2	4.0	5.0	6.2	7.5	8.7

* Quimby, E. H.: Dosage Calculations in Radium Therapy, College of Physicians & Surgeons, Columbia University, New York City.

static cancer—8 per cent of the total group.

Kennedy [4] reported a series of 193 neck dissections in which 46, or 24 per cent, were histologically positive.

On the basis of the above data, one is impressed with the fact that prophylactic neck dissection can at best be useful in a relatively small group of cases. We do not advocate prophylactic neck dissection. It is our practice to have the patient observed at intervals of one month or less for the first year after treatment of the primary lesion, then increase the interval between follow-up visits to two and three months. In addition, the patient is fully acquainted with the facts of his disease, and advised to come for an examination immediately if any swelling occurs in the neck. Even the less intelligent patients, under these circumstances, have voluntarily cooperated.

Prophylactic irradiation of the neck, to be of any use, would require the irradiation of the entire neck node-bearing region with tumor doses of at least 3000 r to 5000 r. Doses under this amount can be of no benefit and therefore need not be discussed. The administration of a cancer-lethal dose to the entire neck, an area about 12 by 15 cm. in size, would be a major procedure and, in our opinion, unjustifiable. I have never observed a fatality due to irradiation of such a large area with a cancer-lethal dose. We do know, however, that the morbidity may extend over a period of from two to eight weeks.

Furthermore, we all realize that external irradiation alone will not completely obliterate or cure cervical metastases except in the occasional highly malignant and radiosensitive type of lesions.

The late radiation changes in the skin of the neck, which are inevitable after a cancer-lethal tumor dosage, add to difficulties when such a patient later develops metastases. Further irradiation in such a case, even if indicated, may result in very severe skin damage, which ultimately may require plastic procedures, or may give rise to serious complications, such as radionecrosis and sloughing.

In addition to these facts, the statistical data, as in the case of prophylactic neck dissection, limits the usefulness of prophylactic irradiation to an extremely small group of cases. *On this basis we never use prophylactic irradiation or neck dissection in the treatment of cancer of the oral cavity, naso-, oro-, or hypopharynx or larynx.*

TREATMENT OF CERVICAL METASTASES BY ANATOMIC REGION

As has already been pointed out, cervical metastases from different anatomic regions in the oral cavity, naso-, oro- and hypopharynx and from neck structures, vary in the lymphatic spread and, not infrequently, in histology. For this reason, no generalizations can be made which would cover the treatment of all metastases to cervical lymph nodes. The metastasis from cancer in each anatomic region renders itself to individualization according to certain accepted generalities.

Metastasis from Cancer of the Lip. About 29 per cent of the patients with cancer of the lip present metastases on admission. Another 8.5 per cent develop metastases after treatment of the primary lesion.[10]

Individualization in the selection of the treatment procedure is necessary. Inasmuch as a large percentage of cancer of the lip has enlarged palpable lymph nodes, a large proportion of which are inflammatory, it is imperative to prove the presence of metastases by biopsy before any treatment is considered.

When metastases are present at the time of admission, radiation therapy may be administered without particular risk at the same time and in conjunction with irradiation of the primary lesion. It is generally agreed that external irradiation should be supplemented by implantation of radon directly through the skin or after surgical exposure. In the series reported by Martin, MacComb and Blady,[10] 33 cases of proved cervical metastases were treated by interstitial implantation of radon alone. Of this group, 11 were free of disease five years later.

Neck dissection may be carried out as a one-stage procedure at the time of the surgical excision of the cancer of the lip, especially if the metastasis is limited to the submental and submaxillary regions. When the cancer of the lip is an extensive growth and requires a formidable surgical procedure, it is preferable to wait until the patient has fully recovered from this procedure before proceeding with the neck dissection.

When the metastasis occurs after the primary disease has been controlled, then a partial or radical neck dissection is indicated.

Metastasis from Cancer of the Cheek. The incidence on admission is about 40 per cent, and an additional 8 to 15 per cent develop metastases later in the course of the disease. Histologically, cancer of the mucous membranes of the cheek usually is a well-differentiated epidermoid variety of tumor, and for this reason metastasis tends to occur rather late in the course of the disease.

The treatment for neck nodes on admission can either be by neck dissection or by a combination of external irradiation and interstitial implantation of radon. If the treatment of the primary lesion is by one of the radiation methods, the treatment of the metastases can be carried out simultaneously by external irradiation. The size of the portal should be large enough to cover adequately the size of the lesion. A tumor dose of at least 5000 r is delivered to the metastases, followed by implantation of radon seeds in a tissue dosage of 5000 to 10,000 gamma roentgens. At our clinic we not infrequently follow up the external irradiation with a partial neck dissection and implantation of radon into the tumor bed and in the adjacent areas of lymphatic drainage.

Where the treatment of the primary is by surgical excision, we usually combine this procedure with a neck dissection; if too extensive, the neck dissection is performed within a period of one to two weeks after the treatment of the primary.

For metastases developing after successful treatment of the primary, we advocate neck dissection.

Metastases from Cancer of the Tongue. The incidence of cervical metastases from cancer of the tongue on admission is about 39 per cent. An additional 24 per cent subsequently develop metastases, making a total of about 63 per cent that have metastases sometime during the course of the disease.[11]

In those cases in which the primary lesion is being treated by radiation, the treatment of the metastases should be limited to the individual nodes themselves and not to the entire neck region, unless there is extensive involvement. Immediately after completion of the external irradiation, additional treatment in the form of interstitial implantation of radon is necessary. The implantation of radon gold seeds may be made directly into the metastases through puncture wounds in the skin or, preferably, for more accurate distribution of the implants, by surgical exposure of the node. A tissue dosage of 5000 to 10,000 gamma roentgens should be delivered. In the presence of large, bulky metastases, it may be desirable to excise the metastases locally and to implant gold radon seeds in tissue doses of from 8000 to 12,000 gamma roentgens into each region of the neck which is involved.

In the cases where the primary lesion is removed surgically, a combination neck dissection may be carried out at the same time

if the general condition of the patient does not contraindicate such extensive surgical procedures.

Where the metastases appear after the primary has been successfully treated, the treatment of the cervical metastases is by radical neck dissection. The following conditions have been suggested as indications for neck dissection: [3, 11]

1. Metastatic cancer should be palpably demonstrable in the neck, and proved histologically.
2. The primary lesion should be healed and show no recurrence.
3. The primary lesion should neither have involved nor crossed the midline.
4. The metastases should be operable from the standpoint of location and mobility in the tumor bed.
5. The metastases should be unilateral and on the same side as the primary lesion.
6. The patient's general condition should be such as to be able to withstand the operation.

If the case does not conform to all these conditions, the patient's chances of cure probably are better under a combination treatment by external radiation supplemented by interstitial implantation of radon gold seeds.

Metastases from Cancer of the Floor of the Mouth. About 32 per cent have metastases on admission, and another 20 per cent develop metastases after treatment of the primary growth. The five-year survival rate, as reported by Martin, is 29 per cent in the group without cervical metastases, and 22 per cent in the group with metastases.[12]

The indications described for the treatment of metastases from cancer of the tongue should be observed in the treatment of metastases to lymph nodes in the neck from cancer of the floor of the mouth.

Metastases from Cancer of the Tonsil. Reports from the literature indicate that metastases from cancer of the tonsil and oropharynx may occur in from 65 to 92 per cent of the cases. Martin and Sugarbaker reported in 1941 on a series of 157 unselected consecutive cases of cancer of the tonsil seen at the Memorial Hospital. Of this group, 76 per cent of the cases had metastases on admission, and another 3 per cent subsequently developed metastases. For the group without metastases on admission, the five-year survival rate was 38 per cent, and for the group with metastases on admission, only 8 per cent. An interesting observation was the presence of bilateral metastases in about 14 per cent of the group with metastases.

The histology of the tumors of the tonsil and oropharynx shows a high incidence of anaplastic varieties of epidermoid carcinoma, lymphosarcoma and lymphoepithelioma. This fact plays an important part in the selection of a treatment modality for the metastases.

Because of the fact that metastases from the tonsil frequently occur in the subdigastric nodes, it is frequently possible to treat both the primary lesion and the metastases through the same portal. When the metastases occur in the upper deep cervical regions, a larger portal may be required to cover both the primary lesion and the metastases. Where the nodes are widely separated, multiple portals, adequate in size to cover the individual nodes, should be employed. A minimal tumor dosage of 5000 r is delivered, and this is supplemented by interstitial implantation of radon. For nodes lying superficially, the implantation may be directly through the skin; otherwise, it is preferable to expose these nodes surgically. A tissue dose of about 5000 to 10,000 gamma roentgens should be delivered.

For cervical metastases occurring later in the course of the disease and after the primary growth has been controlled, neck dissection may be employed in selected cases and only after thorough investigation to rule out more distant metastases. Where large metastases are present, it may be highly desirable, in the management of the disease, to perform a radical neck dissection and implant radon seeds. In order to get a uniform and cancer-lethal dose, it is necessary to deliver from 8000 to 10,000 gamma roentgens to each region of the neck, along which lymphatic spread is likely to occur. In our experience this has been an extremely valuable palliative procedure. In some of these cases, no further metastases appeared for a period of one to two years. Death, in these cases, was due to recurrence and local complications of the primary lesion.

Metastases from Nasopharyngeal Cancer. On admission 77 per cent have cervical metastases; another 4 per cent develop metastases later in the course of the disease.[8]

In cancer of the nasopharynx, we are dealing with a highly malignant anaplastic, radiosensitive growth which tends to metastasize early and widely to both sides of the neck. The problem of treatment, therefore, is one of employing adequate irradiation. Cervical metastases from cancer of the nasopharynx can be permanently controlled by radiation. Death in these patients is due either to local extension of the nasopharyngeal disease or to distant metastases. Neck dissection is of little practical value in the treatment of metastases from the nasopharynx. Surgical exposure for more accurate implantation of radon, however, is definitely indicated.

TABLE 5. ANALYSIS OF TREATMENT OF CERVICAL METASTASES FROM CANCER OF LARYNX: 1930–1941 INCLUSIVE †

Treatment	Cases	D.O.D.	D.O.C.	N.E.D.
X-ray	22	21	—	1*
X-ray plus radon	1	1	—	—
Surgery	1	—	—	1
Combination of surgery, x-ray and/or radon	7	3	1	3

* Reticulum cell lymphosarcoma.
† From Blady, J. V.: Am. J. Roentgenol., 58:331, 1947.

Metastases from Cancer of the Intrinsic and Extrinsic Larynx and Hypopharynx. Metastases are infrequent in cancer of the intrinsic larynx. In an analysis of 156 cases, only 13, or 8 per cent, had metastases on admission, while another 16, or 10 per cent, developed metastases later in the course of the disease.[1]

At Temple University Hospital prior to 1939, cervical metastases from cancer of the larynx were treated by external irradiation alone. There were no survivals.[1, 2]

Since 1940 the treatment of cervical metastases from cancer of the intrinsic and extrinsic larynx in our Tumor Clinic has been as follows: (1) For patients presenting metastases on admission, roentgen treatment is employed for treatment of the primary in the larynx and, if possible, the metastases are incorporated in the same portal. If not, an additional portal is employed. Following the irradiation, either before the severe radiation epitheliitis develops, or after it has completely healed, the metastases are surgically exposed and radon is implanted in a tissue dosage of 5000 to 10,000 gamma roentgens, or a neck dissection, with or without the implantation of radon, is performed; (2) for metastases occurring after the primary disease has been controlled, a neck dissection is performed. Radon is implanted when there is a perinodal infiltration. In this group radiation alone is never used in the treatment of metastases.

Metastases from Cancer of the Skin of Face and Neck. The epidermoid variety of cancer of the skin is a well differentiated tumor and only rarely—and usually late in the course of the disease—does one encounter a metastasis at the time the patient seeks medical attention. In such cases, the treatment should be by wide surgical excision of the primary lesion and, if the metastatic nodes are close to the primary, the lymphatics and the nodes should be removed in continuity. If not, the treatment of the primary may be either by radiation or surgery, while the treatment of the metastases should be by neck dissection with or without the implantation of radon.

In cases of metastases occurring after treatment, and where the primary lesion has been controlled, a neck dissection is indicated.

The treatment of cervical metastases from a melanoma is by a thorough radical neck dissection, preferably in continuity with the primary lesion. Radiation is of no value in the treatment of metastases from a malignant melanoma.

ANALYSIS OF RESULTS

In the period from 1940 to 1946, a total of 87 patients with cervical neck metastases in the Tumor Clinic of Temple University Hospital was treated by neck dissection. A total of 116 procedures, consisting of a radical or a partial neck dissection with or without the implantation of radon, surgical exposure of metastases and implantation of radon, and surgical exploration, was performed on these 87 patients. Six patients received treatment for bilateral neck metastases. One procedure was performed in 67 patients; two procedures

TABLE 6. ANALYSIS OF LOCATION OF PRIMARY LESION

Larynx	27
Tongue	12
Piriform sinus	7
Tonsil	6
Undetermined primary	5
Floor of mouth	5
Oropharynx	4
Lip	3
Salivary gland	3
Upper and lower gingiva	3
Thyroid	3
Melanosarcoma (skin of head and face)	2
Epiglottis	1
Hypopharynx	1
Nasopharynx	1
Nose	1
Buccal mucous membrane	1
Breast	1
Antrum	1
Total	87

in 15 patients; three procedures in four patients and four procedures in one patient.

The most common anatomic sites for the primary disease in this group of cervical metastases were larynx, tongue, piriform sinus and tonsil (Table 6).

A five-year survival analysis may be reported on the three-year period from 1940 to 1942, during which time a total of 24 patients was treated. Of this group, 16 died of their disease; 2 died of other causes * without evidence of recurrent or metastatic cancer, and 6 have survived five years or longer. Inasmuch as the two patients dying of other causes did not survive their disease longer than one year, statistically they are being considered as failures of treatment. The five-year survival for this group of 24 patients is 25 per cent.

TABLE 7. NECK DISSECTIONS FOR CANCER JAN. 1, 1940 TO JAN. 1, 1942 *

Site of Cancer	Total No. of Cases	Five-Year Survivals	Died of Other Causes
Larynx	11	4	1
Piriform sinus	4	2	0
Tonsil	2	0	0
Alveolar ridge	2	0	0
Tongue	1	0	0
Salivary gland	1	0	0
Soft palate	1	0	0
Floor of mouth	1	0	0
Lip	1	0	1
Totals	24	6	2
Five-year Survivals.		6	
Net five-year survival rate (6/24)		25 per cent	

* In all cases metastasis was proved histologically.

SUMMARY

The importance of "a lump in the neck" is stressed, as it may be the first sign of a cancer elsewhere in the body.

In an analysis of 1290 cases of malignant neoplasms of various anatomic regions of the body, cervical metastases were present in 13.5 per cent of the cases. Fifty-three per cent of the cervical metastases were associated with primary growths in the head and neck regions, and 30 per cent in lymphoblastomas.

The treatment of cervical metastases by neck dissection and by radiation methods, and the indications for these methods are presented. Treatment of cervical metastases from cancer arising in the lips, cheeks, tongue, floor of the mouth, tonsil, oropharynx, nasopharynx, intrinsic and extrinsic larynx, hypopharynx and the skin of the face and neck is discussed.

From 1940 to 1946 a total of 87 patients with cervical metastases was treated by neck dissection. In the cases treated from 1940 to 1942 the five-year survival rate is 25 per cent.

SOMMAIRE

L'importance "d'une plaque dans le cou" est souvent le premier signe d'un cancer situé dans une autre partie du corps. Dans une analyse de 1290 de néoplasmes malignes de différentes parties du corps, on rencontra des métastases cervicales dans 13.5% des cas. 53% des métastases étaient associées avec des

* One patient died of peritonitis following an operation for a strangulated hernia, and the other from cancer of the stomach.

tumeurs primaires de la tête et du cou et 30% avec des lymphoblastomes. Le traitement des métastases cervicales par la dissection du cou et par l'irradiation est indiqué. Les emplois de ces méthodes sont discutés. Le traitement de métastases cervicales cancéreuses des cancers ayant leur origine aux lêvres, aux joues, à la langue, au plancher de la bouche, dans l'oropharynx, dans le nasopharynx, dans l'hypopharynx, dans la peau de la figure et du cou est la base et l'étude de nombreuses recherches.

De 1940 a 1946, un total de 87 malades avec métastases cervicales furent traitées par la dissection du cou. Dans les cas traités de 1940 a 1942, il y eut une survivance de cinq ans de 24%.

SUMARIO

El autor discute la importancia de las tumefacciones de la region del cuello y llama la atención de que frecuentemente son el primer indicio de la existencia del cancer en otras regiones del cuerpo.

En una serie de 1290 casos de tumores malignos en diferentes regiones del cuerpo los autores encontraron metastasis en el cuello en 13.5% de los cuales 53% fueron debidos a tumores primarios de la region de la cabeza o del cuello mismo y 30% a linfoblastomas.

También se discute los diferentes metodos quirurjicos en el tratamiento de estos tumores, incluyendo la disección radical y la radioterapia.

En los años del 1940–1946 un total de 87 casos de tumefacciones metastaticas del cuello fueron tratados por la disección. De estos casos, los tratados del 1940 al 1942, 24% hen sobrevivido mas de cinco años.

RIASSUNTO

L' importanza di un nodulo nel collo viene sottolineata quale segno iniziale di un cancro metastatico. Le metastasi cervicali arrivano infatti nella statistica dell'A.—comprendente 1290 tumori maligni degli organi piu' svariati —ad una percentuale del 13,5%. La percentuale si eleva al 53% nei tumori maligni della testa e del collo : al 30% nei linfoblastomi.

L'A. discute il trattamento chirurgico e radioterapico di queste metastasi.

L'asportazione dei noduli cervicali comprende—nell' intervallo dal 1940 al 1946—87 casi. La percentuale di sopravvivenza dopo 5 anni (nei casi curati dal 1940 al 1942) arriva al 24%.

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Nonfunctioning Gallbladder*†

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FAILURE to demonstrate stones radiographically in cases giving clinical evidence of chronic cholecystic disease has presented problems of interpretation and of treatment. Two groups of such cases are found. In one group the radiologist must consider his studies as within normal limits. The second group shows either a very poor gallbladder shadow or no shadow even after repeated attempts to concentrate the "dye" by oral or intravenous methods. This discussion will be concerned with the second group of cases commonly described as nonfunctional gallbladders.

Because these cases were reported by the roentgenologist as nonfunctioning gallbladder, we felt we must know just what that term meant as compared with our surgical findings.

Two hundred cases of chronic cholecystitis which had been subjected to surgery were studied to determine the incidence, pathology, operability, and other factors related to those cases in which the gallbladder had been very poorly or not at all visualized, and in which there were no opacities suggesting gallstones radiographically. The report of a satisfactory study by a competent radiologist, a report of operative findings, and a report of pathologic findings was required of each case accepted in the series. The series is unselected except for these three requirements.

As a result of our comparison of x-ray report with our surgical and pathologic findings, we are convinced that others are correct when they contend that a report of a nonfilling or nonconcentrating gallbladder implies considerable pathology in the biliary tract. Such a condition obtains only with considerable destruction of the gallbladder histology and function so that dye entering the viscus is not concentrated enough to cast a shadow; or when dye is not entering the gallbladder occurs with various obstruction of the cystic duct, or with obliteration of the cavity of the bladder by tumors, stones, inflammatory changes, or very rarely because of congenital absence of the gallbladder. Thus, the gallbladder which cannot be visualized as well as the gallbladder showing filling defects or opacities must be considered to have advanced pathologic changes present.[7] Judd states that positive x-ray evidence indicating pathologic change in the functions of the gallbladder is reliable in as high as 97 to 98 per cent of the cases.[3] No case in this series failed to show advanced pathology. One case too recent to include in the series proved to have congenital absence of the gallbladder as an explanation for the nonvisualized cholecystograms. It must be admitted that clinical evidence of cholecystic disease in this case was far from decisive, and that it was well realized prior to surgery that functional factors were largely responsible for the patient's symptoms.

Some investigators have indicated that various extrabiliary conditions may affect the filling and emptying of the gallbladder.[2, 6] Peptic ulcer, pernicious anemia, thyrotoxicosis, myxedema, diabetes mellitus, obesity, tuberculosis, chronic appendicitis, and poor excretion of the dye by the liver have been mentioned as contributing to error in cholecystographic studies. Good and Kirklin studied these conditions in regard to possible error, and concluded that one is not likely to be misled in a careful examination.[1, 4] Such errors did not appear in this series of cases. In fact, failure to visualize the gallbladder carried an ominous message of advanced pathology, prolonged hospitalization, difficult surgery, and increased mortality.

All cases not visualized after routine oral ingestion of gallbladder dye were studied after "intensified oral technic" of administration. Frequently this was followed by a satisfactory visualization with demonstration of stones and other defects of the gallbladder. If no gallbladder shadow could be demonstrated after the "intensified oral technic" the intravenous route of administration was employed. Thus, all cases in the nonfunctioning group of this series had been studied

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* Read before the Twelfth National Assembly, United States Chapter, International College of Surgeons, Chicago, Sept. 29–Oct. 4, 1947.

† From the Department of Surgery, Graduate Hospital, University of Pennsylvania.

by the intravenous method, but in no case did intravenous studies show a shadow if the intensified oral method had failed to show a dye concentration in the gallbladder.

In the experience of one of us (Bates) there was a case where double oral administration proved negative and intravenous method showed a normally functioning gallbladder. This was a young man in the early twenties with so little clinical indication of gallbladder disease that repeated studies were performed. Biliary drainage showed normal clear "B" bile. Seven years have passed since those studies and the patient is still free of any suggestive gallbladder symptoms.

Eighteen of the 200 cases of chronic cholecystitis fell in the nonfunctioning or nonfilling group—a general incidence of 9 per cent. The average age was 51 years with about equal distribution in each decade from 30 to 70 years of age. There were 4 males and 14 females (Table 1).

TABLE 1. INCIDENCE.

Number of cases of chronic cholecystitis reviewed	200
Number of cases in the "Non-Functioning" group without demonstrable opacities or shadows	18
Incidence of the Non-Functioning Gallbladder	9%
Males, 4 Females, 14	
Age Incidence, Average	50.9 Years
Less than 20 years of age	1
20 to 30 years of age	0
30 to 40 " " "	4
40 to 50 " " "	4
50 to 60 " " "	3
60 to 70 " " "	4
Over 70 " " "	2
Total	18

The seriousness of such cases is evidenced in a number of ways. While it is customary for the average cholecystectomy patient to return home on the tenth postoperative day, only two of the nonvisualized cases had a hospital stay of less than 15 days. The average period of hospitalization was 28 days, and 8 of the cases remained in the hospital over a month (Table 2).

TABLE 2. MORBIDITY AND MORTALITY.

Time in Hospital:		Cases
Less than 15 days		2
15 to 30 days stay		8
Over 30 days stay		8
Average 26 days for all cases		
Mortality:		
6 deaths in the series of 200	3%	mortality
3 deaths in the nonfunctioning group	15%	"
Contribution of this group's deaths to over-all mortality rate	50%	

Three cases died, giving a mortality rate of 15 per cent for the group of 18 cases. Since there were only 6 deaths in the entire series of 200 (3 per cent), deaths in the nonfunctioning group contributed 50 per cent to the over-all mortality rate. One case succumbed to uremia and cardiac failure on the twelfth postoperative day; one died on the twentieth day of hypertensive heart disease, septicemia, and subhepatic abscess; and the third expired on the fifty-fifth day after two surgical attempts to correct a postoperative biliary fistula. Recorded postoperative complications included urinary retention requiring suprapubic drainage (1 case); pulmonary atelectasis (1 case); superficial wound infection (1); and the biliary fistula mentioned above which finally terminated fatally.

This man came to us after six months of complete severance of the common duct at the level of the cystic duct. In spite of the fact that a piece had been removed, the cut ends were open and a trickle of bile occasionally reached the duodenum. Unfortunately the first attempt at repair was unsuccessful, and a second attempt was followed by a cardiac death.

Exploration of the common duct is carried out in some clinics in 50 per cent of the cases undergoing cholecystectomy. This surgical service has felt that only strong indications of common duct pathology justify the procedure. It is therefore significant that 6 of the 18 cases were subjected to exploration of the common duct, indicating the advanced pathology found at operation. No case of nonfilling or nonfunctioning gallbladder in

this series failed to show advanced pathology. Three cases showed chronic inflammatory changes, thickening of the wall, areas of hemorrhage, scarring, and destruction of the mucosa. The other 15 cases showed all of these changes, and in addition these gallbladders contained nonopaque stones of various types. One case in addition to showing such pathology of the gallbladder, had a suspicious thickening of the head of the pancreas. In this case the gallbladder was evacuated of its stones, and a cholecystjejunostomy was performed. The jaundice cleared rapidly, and a five-year follow-up failed to give evidence of carcinoma or other significant difficulties.

Symptoms encountered in these cases of nonfunctioning gallbladder do not vary greatly from those found in other cases of chronic cholecystic disease. Findings are reviewed in detail in Tables 3 and 4. Upper abdominal distress, especially to the right of the midline is the most common chief complaint, and radiation to the back, shoulders, and sternum the most frequent associated complaint. Tenderness over the gallbladder area is the most frequent physical finding. Nausea, vomiting, and constipation occur in a third of the cases but, surprisingly, fat intolerance, belching, and flatulence do not appear as prominently as we might expect. Jaundice was noted in 7 cases. Duration of symptoms is tabulated in Table 5. Eleven cases had symptoms for more than a year while 7 denied symptoms of long duration. Perhaps certain features of hospitalization insurance may contribute to histories of short duration. Most patients, however, could recall symptoms of significance over a period of at least five years. One fourth of the patients had lost significant amounts of weight, and this had usually been noticed during the preceding six months.

TABLE 3.

Chief Complaints	Cases
Pain in right upper abdomen	9
Pain in epigastrium	3
Vague abdominal discomfort	3
"Indigestion"	2
Severe and typical colic	1

TABLE 4.

Associated Findings and Complaints	Cases
Tenderness over gallbladder area	11
Jaundice	7
Nausea	7
Vomiting	6
Constipation	6
Relation of pain to meals	4
Recent chills and fever	3
Frequent belching	3
Abdominal fulness	3
Excessive flatus	2
Intolerance to fatty foods	2
Weight loss during past six months (29, 21, 40, 13 and 25 pounds lost)	5
Radiation of Pain	
To lumbar portion of back	7
To either shoulder or scapulae	6
To sternum or substernal area	4

TABLE 5.

Duration of Symptoms	Cases	
Under 1 year:		
2, 6, and 9 months	3	7
2, 3, and 3 weeks	3	
6 days only	1	
Over 1 year:		
1 year	1	11
2 years	1	
3 years	2	
5 years	5	
6 years	1	
7 years	1	

The existence of certain associated diseases was investigated. Half of the patients were considered obese. Evidence of cardiac disease was found in 7 patients, and hypertension was present in 4 cases. All of the women gave a history of one or more pregnancies carried to term. The role of recent infections was not outstanding, but in two instances this was apparently a factor in the exacerbation causing hospitalization.

Intraduodenal tube drainage of the gallbladder as a means of diagnosing cholecystic pathology finds additional support in this

series of cases. While the procedure was carried out in only three of the nonfunctioning cases, the diagnosis was indicated in each instance since no "B" bile could be recovered.

The follow-up records of all 15 surviving cases indicated good response to surgical treatment. Only one case was readmitted for similar complaints; study revealed that most of his symptoms were now due to air-swallowing augmented by psychogenic factors. He improved remarkably after help in correcting these difficulties. No case presented any serious or prolonged problems after leaving the hospital.

Though this is too small a number of cases from which to draw definite conclusions, it has convinced the authors that a report of nonfunctioning gallbladder by a good roentgenologist means definite gallbladder or duct disease.

SUMMARY

1. Two hundred surgically treated cases of chronic cholecystic disease have been reviewed to determine factors relating to cases in which the gallbladder could not be visualized radiographically, and in which no opacities suggesting stones in the gallbladder could be demonstrated.

2. In no case in this series did intravenous administration of the dye give visualization of the gallbladder if visualization had not been obtained after "intensified oral administration" of the dye.

3. A competent radiologist's report of a nonfunctioning or nonfilling gallbladder carries with it the implication of advanced pathology, increased morbidity, difficult surgery, and increased mortality. In all cases of nonfunctioning gallbladder in this series advanced pathology was demonstrated at operation.

4. Follow-up records indicate that good results after leaving the hospital may be expected with surgical treatment of the nonfunctioning gallbladder.

SOMMAIRE

L'auteur passe en revue 200 cas de cholécystite chronique afin de déterminer les facteurs que agissent de façon à ce que la vésicule biliaire ne soit pas visualisée radiographiquement et dans laquelle aucune opacité de calculs biliaires ne soit présentée.

Dans aucun cas de cette sorte, l'administration intraveineuse de colorant n'obtient la visualisation de la vésicule biliaire quand la visualisation n'a pas été obtenue après l'administration orale intensive du colorant.

Quand un radiologiste compétent fait un rapport d'une vésicule biliaire nonfonctionnante ou nondistensible, cela suggége un état pathologique avancé, une augmentation de morbidité, une chirurgie difficile, et une haute mortalité. Dans tous les cas de cette serie ou la vesicule biliaire ne fonctionnait pas, on constata à l'opération un état pathologique avancé.

Les malades observés après leur depart de l'hopital nous permettent de dire que le traitement chirurgical de la vésicule biliaire nonfonctionnante donne de bons résultats.

SUMARIO

El autor hace una revista de 200 casos de colecistitis cronica tratados quirurjicamente con el objeto de determinar los factores relacionados con aqueyas vejigas que no fue posible visualizar radiograficamente.

En esta serie ningun caso pudo ser visualizado con el agente radio-opaco cuando se uso por la via intravenosa si habia antes fracazado por la via oral cuando se dio por el metodo de administracion oral intensificado.

El reporte del radiologo que indica una vejiga que no se visualiza o que no funcione lleva la implicacion de una patologia avanzada, un aumento de la morbilidad, mayor dificultad para el cirujano durante la operacion y por consiguiente mayor mortalidad. En todos los casos en que el examen radiologico mostro una vejiga que nofuncionaba la operacion siempre demostro una patologia avanzada.

En estos casos la cirujia ha probado dar buenos resultados.

RIASSUNTO

Considerazioni cliniche dedotte da duecento casi di colecistite cronica, nei quali la vescichetta biliare non era visibile radiologica-

mente e nei quali non esistevano opacita' riferibili a calcoli.

La visualizzazione della viscichetta biliare non e' stata possibile se non dopo un'intensificata sommistrazione perorale del mezzo di contrasto.

La diagnosi da parte di un competente radiologo di una vescichetta biliare non funzionante implicherebbe—in base al controllo operatorio—delle lesioni gravi, un intervento operatorio piu' difficile, e con cio', una morbilita' ed una mortalita' postoperatoria piu' elevata.

La cura chirurgica di questi casi offrirebbe —a distanza di tempo—degli eccellenti risultati.

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New Method of Esophagoplasty

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THE problem of devising a procedure for esophagoplasty which will be successful functionally is a continuing challenge to surgeons. The fact that other workers have been unable to equal the results reported by Yudin suggests that his procedure, too, is not the answer. The failure of currently employed procedures to meet the requirements prompts publication of the present paper.

The four source materials from which the gastroesophageal tube may be made are *skin* (Bircher), *jejunum* (Wullstein, Lexer, and others), *large intestine* (Kelling, Vulliet, Rioth) and *stomach* (Kirschner). Each has its disadvantages. With skin there is a tendency to fistula formation. Jejunum was not designed by nature to stretch longitudinally and, suffering from insufficient blood supply, more tubes made from it have died than lived. The disadvantage about the large intestine, especially before the advent of sulfonamides and penicillin, was the infectiousness of its contents. The disadvantages to use of stomach were two: (1) The magnitude of the operation, with the anastomosis to the cardia high under the diaphragm, and the Y-anastomosis lower down; (2) the fact that in this type of case the stomach very often is contracted, hence the tube will not always reach well up into the jugulum.

The lesser curvature of the stomach seems designed to support the stomach between the esophageal hiatus and the portia hepatis. The greater curvature, however, has been designed to accommodate the sudden influx of food and to hold it until it can be fed piecemeal into the intestine for digestion. The lesser curvature, therefore, is the part that prevents sufficient stretching of the Kirschner tube, not the stomach as a whole.

How far this stretching of the greater curvature can go is well demonstrated by the accompanying illustration. Figure 1 shows the stomach of a man practically starved to death; Figure 2, the amount of tube available by the Kirschner method; and Figure 3 the amount of tube available if the lesser curvature is excised and the greater curvature sewn under stretch. In the body from which this specimen was taken it reached to the top of the head.

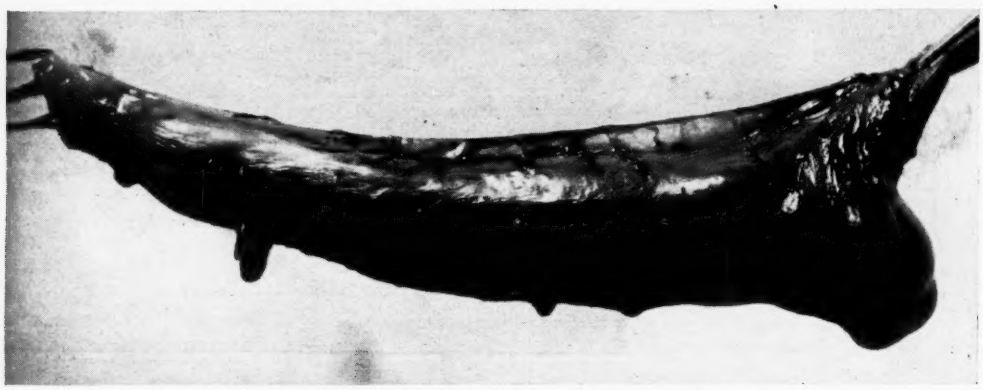

Fig. 1. Stomach of man practically starved to death.

Beyond this there is, in the fundus, a piece of potential tubing in the "return" part between the cardia and the apex of the dome of the fundus where Kirschner and those practicing intrathoracic esophagoplasty place their esophagogastrostomies (Fig. 4).

The blood supply of the greater curvature is ideal. The experiences of Beck, Jianu and Halpern with tubes based on the fundus,

Fig. 2. Amount of tube available by Kirschner method.

tubes that were fed *through* the arterial anastomosis of the fundus, made it likely that this anastomosis would at least be able to feed its own area. This proved to be true.

Three procedures are available:

1. Simple excision of the lesser curvature in all those cases where the stomach is not long enough to reach into the jugulum and proceed with the rest of the operation as described by Kirschner.

2. The lesser curvature can be left attached to the cardia, sewn into a tube and anastomosed lower down with a loop of the intestine.

3. The tube can be left attached to both cardia and pylorus, forming a drain for esophageal secretions when sewn into a tube.

The goal, then, was to slit the stomach from the fundus just above the cardia to the middle of the pyloric antrum.

Since there is no way by which clamps can be applied to the fundus the operation is started by making a buttonhole through the pyloric antrum and applying the clamps upward with one blade through this hole and the other along the anterior surface of the stomach. To eliminate simple suture over or in front of a clamp, which would have impeded instead of assisted the stretching of the tube of greater curvature, forming a fixed suture line, a temporary tacking stitch to control hemorrhage and prevent unnecessary soiling of the peritoneum had to be the solution, and therefore split clamps had to be used.

TECHNIC

Incision. A vertical incision was used in all cases from the xiphisternum to beyond the umbilicus on the right. At the top, a transverse 2-inch incision was added, running to the left and severing the upper attachment of the rectus, thus preparing the opening for the stomach tube (Fig. 5).

Adhesions were separated by blunt dissection until a finger could be hooked around the gastrostomy inside the abdomen. With the scalpel, keeping close to the inside of the posterior rectus sheath, the gastrostomy was easily divided and the opening in the stomach brought into the wound where it was temporarily closed by a few tissue forceps.

Orientation. (1) The placing of the gastrostomy opening in relation to the greater and lesser curvature is defined. The buttonhole must be placed nearer the lesser curvature and, as the old gastrostomy opening is the logical opening for the anterior part of the buttonhole, its suitability for that purpose must be studied. (2) The gastroepiploic artery is found and followed up to see if it will be able to feed the tube. Where abnormal conditions of this artery are present other methods must be employed.

The greater curvature and fundus are carefully liberated, vessels ligated and sutured, particular care being taken to identify and ligate the short gastric artery at the upper pole of the spleen or in the gastrodiaphrag-

Fig. 3. Amount of tube available by sewing greater curvature under stretch.

"RETURN TUBE", NOT TAKEN ADVANTAGE OF IN KIRSCHNER'S METHOD
IN KIRSCHNER'S METHOD THE ANASTOMOSIS TO OESOPHAGUS IS DONE AT TOP OF FUNDUS
OESOPHAGUS
CARDIA CLOSED
R+L GASTRIC ARTERIES NOT ADAPTED TO STRETCH
SHORT GASTRICS
GASTRO-EPIPLOIC ARTERY IS SPECIALLY DESIGNED TO STRETCH

Fig. 4.

Fig. 5. Incision.

matic fold. The fundus is liberated up to the esophagus.

Buttonhole. The lesser sac and the hilum of the spleen as also the entry into the lower abdomen and Morrison's pouch, are packed off with gauze. The hard scar tissue is cut away from around the edge of the old gastrostomy opening until a more or less normal stomach wall abuts on it from all sides. If it is too far away from the lesser curvature or the pylorus, it is closed longitudinally in layers.

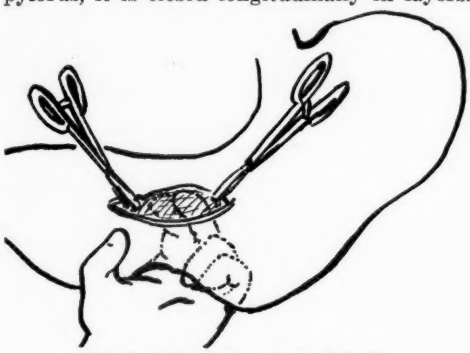

Fig. 6. Making the "buttonhole."

The buttonhole should be about two-thirds of the way from the greater to the lesser curvature and about 1 to 2 inches above the pylorus (Fig. 6). If the old gastrostomy opening partially fulfills this requirement, the other portion is closed and the rest enlarged by means of scissors to the size desired. The opening is then held up and the mucosa followed visually until the mucosa on the posterior wall of the stomach is reached. A fold of this is gripped by means of tissue forceps where the posterior opening in the posterior wall of the stomach will be. There should be a strip of about ¾ inch between the two openings inside the lesser curvature. Both ends of the proposed incision in the posterior wall are defined with tissue forceps and a finger is brought up behind the stomach, pushing the posterior wall through the opening. It is incised carefully on this finger, using a sharp scalpel. The small opening thus effected is enlarged by scissors (Fig. 6).

This part of the operation is emphasized and described in detail because, though seemingly simple, it is possible to commit a number of errors which it will take time to rectify. (1) The buttonhole may be placed too near the greater curvature. This causes a narrowing of the proposed tube at this point. (2) The mucosa of the lesser curvature may be cut right through and the tube made with musculature alone for some distance.

Once corresponding openings in anterior and posterior walls have been made, their corresponding edges are sewn together with chromic catgut on an intestinal needle including all layers. In this way a buttonhole is formed and the stomach given the shape of a lopsided doughnut. The buttonhole stitches are placed all around the opening except for about ½ inch on the oral side where the clamps will be placed. The ends of the sutures are left long.

Section of the Stomach. Two long split clamps, curved laterally, are inserted parallel to each other with one blade through the buttonhole, the other across the anterior surface of the stomach up to the fundus and just lateral to the cardia. A tacking stitch is then run down the slots from the fundus to the buttonhole (Fig. 7). The ends of the tacking stitches are left long and unknotted.

This is the most difficult part of the operation as there is no room under the diaphragm for the needleholder and control of the needle, while sewing toward oneself is precarious at best.

To avoid inclusion of retroperitoneal tissues in the stitch a long-bladed retractor is inserted behind the stomach. Even so, it is very difficult to find the slot again as the needle comes up. For this reason I have had a special instrument made to my design, which circumvents these difficulteis.

Now the stomach is divided between the clamps (Fig. 8). The clamps are removed and the ends of the tacking stitches are brought out into the wound. Bleeding points are caught.

Shaping the Lesser Curvature Tube. The greater curvature portion is packed away in warm saline gauze. Then, with a bent intestinal needle on chromic catgut, pursestring sutures are carefully run around the upper end of the incision in the lesser curvature. The end of the intestinal suture is then

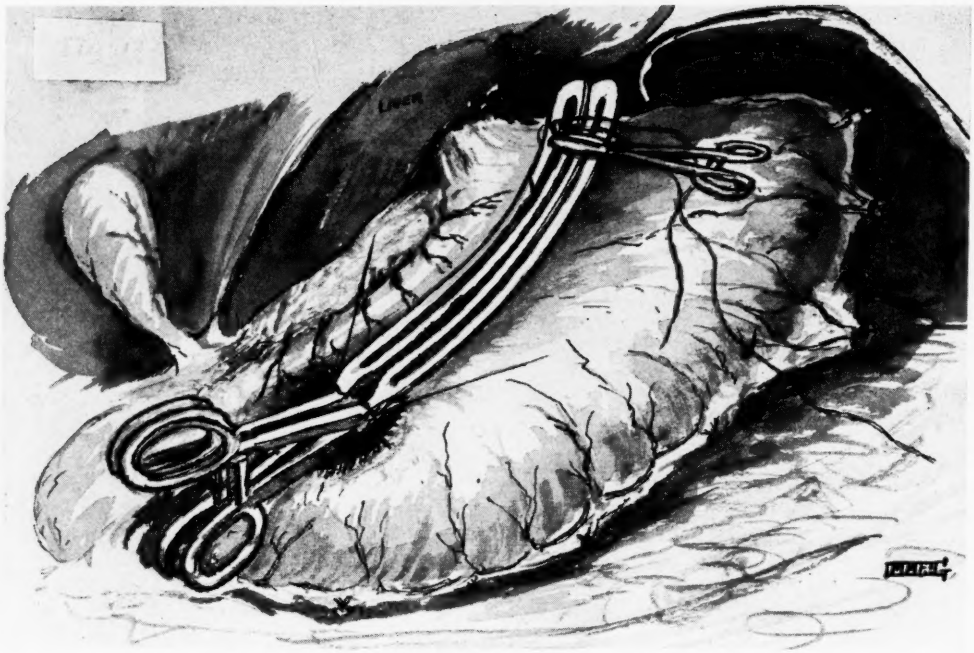

Fig. 7. Split clamps applied before section of the stomach.

knotted to the end of the tacking stitch and both ends held in a clamp for control. (Again it must be emphasized that this portion of the stomach may be partially retroperitoneal and not covered with peritoneum). The suture then closes the lesser curvature with a fine cross-stitch outside the tacking stitch. When the buttonhole is reached it proceeds along it in a Lembert suture, after having been knotted to the other end of the tacking stitch. As the buttonhole portion of the suture line eventually carries the greater part of the strain it must be especially reinforced. A second intestinal suture line, this time in Lembert suture all the way, completes this part of the operation.

Shaping the Greater Curvature Tube. It is essential that this tube be sewn on the stretch. This is the reason why the tacking stitch was preferred to the clamp and suture, since the latter would have formed an unyielding suture line.

With the first of the two intestinal sutures from the lesser curvature knotted to the suture which originally closed the buttonhole, the tube composed of the greater curvature is sutured all along its length with fine stitches and including all layers. As one proceeds, the tacking stitch is loosed stitch by stitch. Meantime, two assistants hold under tension the part that is sewn, taking care not to transmit this tension to the root of the stomach and the solar plexus. When the catgut runs out (usually after about 4 inches) new catgut is knotted to the end and the suturing process continues.

As the fundus is reached a preliminary measurement is taken to determine whether the tube is long enough to meet requirements. If it is not, the "return" tube in the fundus can be incised at right angles to the suture line and sutured.

The tube of greater curvature, having been sutured its entire length, a return line of Lembert sutures is made, closing the serosa over the first suture, the assistants continuing to maintain tension. At the pyloric end it is knotted to the second suture in the lesser

Fig. 8, Section of stomach between clamps.

curvature, continuing once more along the inside of the buttonhole until one reaches the beginning of the tube composed of lesser curvature where the final knot is made to the original buttonhole suture on that side. For further safety the portions containing the buttonhole and lesser curvature are enclosed in a fold of omentum fixed by a few tied sutures.

The Subcutaneous Tunnel. The tube is brought out of the abdomen and the point in the jugulum to which it will reach is defined. An incision parallel to the anterior border of the sternocleidomastoid muscle is made into the subcutaneous tissue. Though surgically this incision is not correct it is chosen because it gives adequate access to the upper esophagus at the second stage of the operation, necessitating the making of only one scar.

A long amputation knife is inserted into the transverse portion of the abdominal incision, superficial to the costal cartilages, and is pushed up subcutaneously toward the jugulum. Down this track a long strong clamp is inserted and opened at intervals as it passes along the way in order to form a canal of ample width by blunt dissection. The process is repeated from above until the two tunnels meet.

Placing the Stomach Tube. The stomach tube is painted with mercurochrome and dusted with sulfonamide powder to prevent as much as possible infection of the subcutaneous tissues of the chest and neck. A long clamp is then inserted through the tunnel from the neck down. It may be necessary to place an incision halfway. This is preferred to pulling the tube from above with a string, as the latter gives no control over

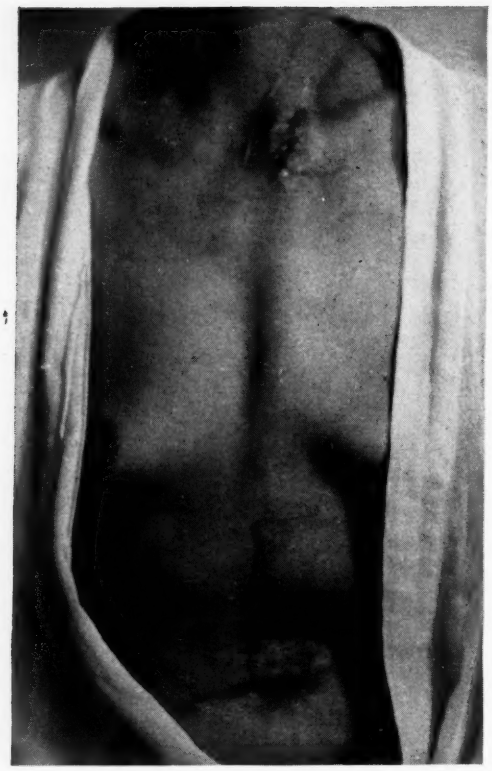

Fig. 9. Final result one month after final operation.

a possible spiral twist in the subcutaneous tunnel and may interfere with the blood supply.

The tube is grasped by its tip and slowly pulled up while an assistant feeds it into the opening below. Thus by pushing and pulling it is carefully worked up into the tunnel until it lies in the required position. The tip is then sutured to the sternocleidomastoid by four or five stitches. This first stage ends with closure of the incision and the abdominal wound, but without suture of the upper end of the left rectus.

The second stage, undertaken when the patient has sufficiently recovered from the first, consists of anastomosis of esophagus to upper end of the tube and has been adequately described by previous authorities. The final result, one month after final operation, is shown in Figure 9.

DANGER POINTS IN THE OPERATION

1. The buttonhole bears the greatest strain. Therefore, the sutures around it must be made with extreme care. A rag of omentum twisted about it probably assists in preventing leakage.

2. Closure of the lesser curvature probably would be improved by sewing the edges of mucosa together with a fine stitch, removing the tacking stitch and closing the tube with two rows of Lembert invaginating stitches.

3. Bleeding from the short gastric artery may cause difficulty. It should be sought for before it is found accidentally. A cholecystectomy clamp is of great help in tying it off.

4. In part, the lesser curvature often is retroperitoneal with vessels entering the posterior surface from the retroperitoneal region.

5. If the esophagus is cut with care not to soil the surroundings, and if the distal stump is doubly carbolized and allowed to sink back into the mediastinum, the result is satisfactory. A small catheter sewn into the wound down to this stump through which chemotherapeutic agents can be introduced for the first few days, may aid in taking care of further infection. Hence there is no necessity to leave the esophageal pouch from which the patient regurgitates into the gastric tube after meals. A simple end-to-end anastomosis between esophagus and gastric tube, with the former well invaginated into the latter, is best.

Adequate preoperative and postoperative care are essential for best results.

SUMMARY

The method described is theoretically sound and in all patients in whom it was employed the tube was perfectly viable regardless of ultimate outcome. Not a single instance even of partial necrosis was encountered. Anatomically, the lesser curvature does not have enough stretchability to be used as a tube replacing the esophagus intra- or antethoracically. This can be overcome by using

the greater curvature with its greater stretchability for this purpose.

SOMMAIRE

L'emploi de la grande courbure de l'estomac est en théorie sain. Dans tous les cas où ce procédé fut employé, le tube ainsi constitué fut viable; pas un seul cas de nécrose partielle fut constaté. Anatomiquement, la petite courbure de l'estomac ne possède pas assez d'extensibilité permettant, son emploi comme tube remplaçant l'oesophage intra ou anté-thoracique. On surmonte cette difficulté en faisant usage de la grande courbure de l'estomac vu l'extensibilité de celle-ci.

SUMARIO

El uso de la curvadura mayor del estomago es teoreticamente de valor y esto ha sido comprobado practicamente en aqueyos paciente en que su empleo probo que el tubo ha si formado mantuvo su viabilidad. No encontramos ni siquiera un caso de necrosis parcial del tubo en los casos en que este fue empleado. Anatomicamente la curvadura menor del estomago no posee el suficiente poder de estrecharse para su utilizacion en la formacion de un tubo para reemplazar al esofago intra o ante-toracicamente. En cambio la curvadura mayor posee gran poder re estrechabilidad.

RIASSUNTO

L'adozione della grande curvatura dello stomaco per la formazione di un canale e' teoricamente esatta. In tutti i casi nei quali e' stata prescelta, ha consentito la formazione di un canale che rimane pervio, indipendentemente dall'esito dell'operazione. In nessun caso si e' verificata una necrosi, sia pure parziale. La piccola curvatura dello stomaco non consente invece una distensibilita' tale, da permettere la sua sostituzione al'lesofago intra- o antero-toracico.

Experimental and Clinical Observations on Hypothermia and Procaine

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THE first observations to be discussed pertain to hypothermia in shock therapy. After a number of years of experimentation, I published,[1] in 1937 and 1939, the first announcement of prevention of shock by local temperature reduction in animals and surgical refrigeration in human patients. Fay, on the basis of clinical studies begun in 1940, in 1942 published a brief note[2] containing the first advocacy of reduction of general body temperature for shock. The subsequent confirmations make it evident that many lives were unnecessarily sacrificed by the traditional heating treatment which was perpetuated during World War II by the authorities who totally disregarded the published proofs.

Nevertheless, all these confirmations have been limited to shock of peripheral origin caused by muscle trauma, burns, or tourniquets on limbs. Clinical shock, on the contrary, is often of visceral origin, arising either from direct injuries of viscera or from systemic causes which largely affect the viscera. Shock is a circulatory phenomenon, and reactions in the pulmonary or splanchnic circulation are sometimes opposite those in the systemic circulation. There is a stronger instinctive prejudice against chilling viscera, for fear of organic injury or at least a depression of function which may lower bodily resistance. Therefore experiments on visceral shock seemed worth-while, to settle definitely whether there is any basis for the clinical conservatism which has clung so stubbornly to treatment for maintaining body warmth.

Rats being the only species available at first, some of the former experiments with peripheral shock were repeated. Rats are easily subject to tourniquet shock; they die after 5 or 6 hours' ligation of one hind leg, or after 3½ or 4 hours' ligation of both hind legs, varying with the room temperature or the individual strength. Local refrigeration greatly reduces the shock, so that they may survive more than 6 hours' ligation of both hind legs. Rats can withstand a more intense bodily hypothermia than man, namely, to about 58° F., but their duration of tolerance is less, so that their survival of temperatures near 80° F. is measured in hours rather than in days, as in the case of man. Reduction of body temperature reduces the severity of tourniquet shock in rats, practically in proportion to the temperature. Thus, a temperature between 60° and 70° F. protects much better than a temperature between 80° and 90° F., but the protection is less than with the much lower temperature of local refrigeration.

The intestine was chosen as representative of abdominal viscera, and shock was produced in three ways. First, the traditional mechanical trauma easily produces severe shock with as little as 5 minutes of massage of the extruded intestine with a soft cloth in salt solution at various temperatures. This is a much shorter time than is required in larger species, and there is considerable blood loss even when manipulations are gentle and no large vessels are broken. Second, the circulation of the entire free portion of the intestine can be stopped by a ligature or clamp for various periods at various temperatures, either inside or outside of the body. Third, through a small abdominal incision the entire free intestine of the anesthetized animal can hang down into a moist chamber at various air temperatures for a selected time, such as 2½ hours. Congestion is produced by gravity; the drops of fluid falling from the bowel can be counted and the entire fluid loss measured, and after the bowel is replaced and the abdomen closed the course of the shock can be followed.

Details must be given elsewhere,[3] but for the present summary it suffices that with all three shock methods the survival was reduced by reduced temperature, and roughly in proportion to the degree of cold. Comparisons of slow and rapid rewarming and all other experimental variations failed to change the basic fact that reduced temperature is harm-

ful in visceral shock of the rat, though it is beneficial in peripheral shock. Applications of heat to keep body temperature normal or even slightly above normal gave better results than cold. This is all the more surprising because local tissue vitality, judged by color, texture and other indications, is much better preserved at low than at high temperatures, just as it is in the limbs. This intestinal shock mortality was therefore contrary to the usual rule that severity of shock is related to severity of tissue damage. It seemed possible that shock might be aggravated by depressed function of the liver or other organs, or by the inflammatory reaction following chilling of the intestine. Therefore I published a doubtful suggestion [4] that hypothermia is perhaps not a suitable treatment for visceral shock.

It was necessary, however, to think of other thermal peculiarities of the rat. It is known that the limbs and other peripheral tissues of man and the large mammals can be frozen solid for limited periods without necrosis; also, according to Ebin [5] their visceral tissues, including blood vessels, liver and brain tissue, can be frozen at the temperature of solid carbon dioxide for one minute without discoverable microscopic damage ensuing. It is shown elsewhere [3] that no such results are possible in the rat, and even the prevention of coagulation by heparin does not prevent the necrosis which follows very brief freezing. Baxter [6] has proved that scalded rats' tails are injured by hypothermic treatment, and I have confirmed this result. Nevertheless, local hypothermia for burns of human patients, in our experience, is spectacularly beneficial, and the failure of surgeons to try it is regrettable.

When it became possible to secure cats and dogs for the shock experiments, the findings became logical. The ligated intestine was much better preserved in color and vitality at low than at high temperatures, and the shock was correspondingly reduced. Stoppage of intestinal circulation for four or five hours at normal temperature is fatal. The tissue changes and severity of shock are increased in a saline bath above normal temperature, while a temperature of 5° to 15° C. in the saline bath allows the animal to survive with only slight depression. These results in the larger mammals can confidently be applied to clinical conditions. If any part of an intestine or other viscus lacks circulation, the surgeon should surround it with cold rather than hot towels. Shock resulting from trauma of viscera, or from trauma or intoxication affecting the entire body, can be appropriately treated by hypothermia. The mild systemic hypothermia cannot equal the results of radical local refrigeration, but there is no physiologic or therapeutic distinction between peripheral and visceral origin of shock, and the contradictory results in rats are merely a peculiarity of that species.

The second topic deals with the new uses of procaine, which until recently ranked only as a local anesthetic, but which displays such remarkable systemic effects that a considerable literature has already accumulated on the intravenous administration. I have had no facilities for making anything more than crude clinical observations and animal experiments on a clinical pattern. Some of the findings may be suggestive for persons who are in position to utilize the necessary exact physiologic and pharmacologic methods.

It is accepted pharmacologic doctrine that procaine anesthetizes first the sensory nerves, because of their smaller caliber or different permeability, and affects motor or other neurones later and to a less degree. The systemic administration of such doses as have heretofore been considered physiologic has been found to produce a perceptible but slight reduction of pain sensitivity. A logical deduction led to my first interest in this subject. In shock studies, the increased vascular permeability in injured regions is a prominent feature; hence it seemed possible that procaine circulating in the blood might diffuse selectively into such injured areas and relieve the associated pain. This theory seems to be substantiated by the relief in cases of burns and of postoperative pains, as reported by Gordon [7] and McLachlin [8] in Canada, the selective permeability being such that dressings of a burned patient can be changed painlessly although there is no noticeable sensory alteration in normal skin areas.

These infusions of procaine in low concentration, usually 0.1 per cent, are now extensively used for the widest variety of painful conditions, with results varying from dramatic success to practically total failure. The benefit of addition of small amounts of a barbiturate has been stressed particularly by Fraser,[9] and glucose and vitamins may aid further (Richards[10]). In general, clinical observations seem to agree with the hypothesis that relief of pain by low-concentration procaine infusions is in proportion to the permeability in the painful region.

I know of no experimental proof of a selective effect of systemically administered procaine upon the sensory nerves of animals. My observations of clinical type in animals indicate no duplication of the results seen in patients. Not only the pain sense in normal regions but also the sensitiveness of wounded areas seem to persist, unless the procaine dosage is high enough to disturb the general consciousness. The empirical conclusion at present is that procaine in low concentration intravenously is an ideal, harmless and nonhabit-forming analgesic for many kinds of pain in human patients, but not in animals. I have had no monkeys, and these statements apply to rats, rabbits, cats, and dogs.

One feature of our work at City Hospital was the introduction of procaine in higher concentrations and larger amounts. The concentration has often been 1 per cent, and the highest dosage in 24 hours has been 20 Gm. Such quantities, which were formerly regarded as prohibitively toxic, are harmless if given slowly enough to avoid disturbances of consciousness. The safety factor is the destruction of procaine within a few minutes after it enters the blood. Thus there is no cumulative effect; the doses may be repeated on as many days as desired, and Jacoby and associates[11] have proved that liver function is not impaired. The more concentrated and more prolonged infusions may relieve some pains which are refractory to smaller infusions.

We also increased the rapidity of the strong infusions to the point of abolishing consciousness. Neurologists may perhaps be interested to explain why speech is the first faculty lost, at a point when the patient can still respond by signs. We had considerable satisfactory experience with this new method of general anesthesia, first for obstetrics and then for miscellaneous surgery.[12] The ideal features are the flexibility, absence of depression, absence of fluid loss by sweating, quick recovery of consciousness, and absence of nausea or other unpleasant sequels. Overdosage brings on a convulsion, which is not dangerous but can be avoided by heeding the plain warning signs, and the tendency is largely obviated by addition of a barbiturate. The safety of the method seemed to be particularly assured by the rule, which seemed uniform in animals and patients, that intoxication is always heralded by a harmless convulsion. It remains true that a mild convulsion is harmless, even if carelessness allows it to occur. But this method of anesthesia has had to be abandoned because of a rare crisis of another kind, namely, a sudden cyanosis and collapse without convulsive or other warning, which may even be acutely fatal. No advance notice is furnished by dermal or other sensitivity tests; also, such an attack may occur in a patient who has previously borne this anesthesia excellently and who also takes it uneventfully afterward. It appears that procaine can be a very valuable agent for general anesthesia if a safeguard can be discovered against this kind of accident.

Naturally, the new interest in procaine is leading to many attempts to settle various problems by animal experiments. But in addition to the previously mentioned differences in action of small doses, there are still greater differences in high dosage in man and animals. First, the above-mentioned collapse without warning has not yet been observed in an animal; the convulsive effect of toxic doses seems to be invariable. Second and more important, procaine does not serve for general anesthesia in animals. Convulsions predominate over unconsciousness; and even in the collapse following a severe convulsion a painful stimulus, such as pinching the tail, elicits a jerk which equals or even exceeds the reaction in the normal animal. Dogs and cats become intensely nauseated and salivated, in contrast to the comfort of human patients.

Because of the great differences between species, at least in effects on the nervous system, much caution is necessary in drawing clinical deductions from animal experiments.

Furthermore, procaine is suggesting new points of view concerning some clinical conditions which cannot be studied in animals. When surgeons use local procaine infiltration for conditions such as a sprain or bursitis, the benefit supposedly is explained by release of muscle spasm and improved local circulation. Intravenous procaine infusions may relieve such pains temporarily or permanently, but the explanation becomes more difficult when arthritis is thus benefitted. Graubard and associates[13] have reported the largest series of such cases, with relief of pain and improvement of function continuing for months, especially in chronic hypertrophic arthritis, but with little or no success in the rheumatoid form. We have had our most striking results in either acute attacks or exacerbations of chronic nonbacterial arthritis. An example is a middle-aged laborer who entered City Hospital with the large joints of both legs typically swollen, hot and painful, the type of case that would ordinarily require strong sedatives for the severe pain and a longer course of salicylates and physical therapy. Having been admitted late in the afternoon, he received an intravenous infusion of 1 per cent procaine for 1 hour. Pain was nearly abolished in one leg and reduced in the other, but after a few hours the full intensity of pain returned and required sedation during the night. At 9:30 the next morning another infusion of 1 per cent procaine was started. Pain disappeared completely in about 2 hours. The infusion was continued until 1:30 p.m., when the patient complained of slight weakness. Pain and tenderness remained absent; the joint swelling promptly subsided, and the patient immediately left his bed and walked comfortably until discharged. We do not know how to predict which cases of arthritis, neuritis, etc., will respond and which will get little or no relief. But these instances of either immediate cure or remissions lasting for months in chronic cases are theoretically challenging. Pathologists who theorize about the nature of arthritis must take account of this possibility of abrupt termination, whether interpreted on an allergic basis or otherwise, and there may also perhaps be new questions concerning the pharmacology of procaine[14] or its split products.

The two halves of this discussion lead to two conclusions, both pertaining to limitations of animal experiments. First, recognition of the thermal peculiarities of the rat species removes apparent objections to the hypothermic treatment of burns and of visceral as well as peripheral shock. Second, the remarkable clinical effects of intravenously administered procaine suggest new problems in pathology and physiology, but the experiments which are undertaken to solve them must be interpreted with consideration of the different actions of this drug in man and laboratory animals.

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Cutis: Its Various Uses in Surgery

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FOR many years past,[1] surgeons have been greatly concerned about the desirability of a suitable type of tissue for the making of repairs and especially for the replacement or filling in of defects, more especially those occurring in the abdominal and chest walls.

To secure such repair tissue the surgeon often has borrowed from the various aponeuroses, and from fascia lata. The defects caused by the removal of such tissue have at times caused trouble, such as muscle hernia. Furthermore, at times the results of the attempted repair have not been all that could be desired from the standpoint either of immediate or long range result.

In cutis the surgeon has an ideal material which lends itself readily for the purposes of suture, reenforcement or replacement wherever and whenever strong and dependable material is needed for purposes of suture or repair. This repair material may be used to replace peritoneum, pleura or aponeurotic tissue.

Cutis possesses many advantages. For instance, it is easily obtainable from the tissues of the patient who needs it. It vascularizes quickly and heals into its new position in a short time. Its use is seldom followed by infection and it is gradually converted into fibrous tissue.

Some Indications for the Use of Cutis. The greatest field of use for cutis undoubtedly lies in the repair and reenforcement incidental to the cure of large hernias,[2] more especially those of the incisional type. Following that, I would say that it is especially useful for the suspension of organs such as the uterus, more particularly the cervical portion of that organ after subtotal hysterectomy. Again, it may well take the place of catgut tape for fixation purposes incidental to the suspension or fixation of the prolapsed or floating kidney. Likewise, a sling of sorts could be made of cutis to support the kidney which could be anchored to the twelfth rib or elsewhere so as to bring about relative fixation of the kidney. Also, it may be used satisfactorily in the Henderson type of operation for chronic, recurrent dislocation of the shoulder. It is useful as replacement material for dural defects. We have repeatedly made use of the cutis strip for the purpose of ligating large veins and arteries[3, 4, 5] such as the vena cava and the carotid artery, without a failure to date; also, the femoral artery in a case of aneurysm involving that vessel. Cutis has been used with great success by Rehn[1] and others for lining material incidental to the reconstruction of joints; to bind together oblique fractures of the long bones of the arms or legs, more especially the femur and the humerus; to repair fractures of the patella; for reconstruction of the crucial as well as the external ligaments of the knee[6]; to build up underneath the skin and thereby eliminate depressions of surface contour: two superimposed layers may be slipped into position for this purpose. Cutis can be of value in dealing with certain cases of cancer of the breast that have advanced to so great an extent that it may become necessary to resect a portion of the chest wall and pleura.[7] The resected pleura can be readily replaced with cutis.

Technic. In regard to hernias, we make the best possible repair we can and then reenforce strongly with cutis, anchoring it on firm stretch with interrupted sutures of stainless steel wire, usually 32 gauge, or heavier.

When ligating blood vessels we generally have made use of a strip of cutis which has been cut ⅝ of an inch in width (on stretch this narrows down quite a lot). The strip is carried twice around the blood vessel and drawn sufficiently tight, after which the ends of the cutis strip are held securely at the desired degree of tautness and firmly held together with a hemostat. Several U sutures are passed through the parallel ends and securely tied. Ligation of the free ends of the cutis strip into a knot is not satisfactory as the knot will slip and the vessel will not be held firmly by the slippery tissue. In

ligating large veins like the vena cava it is necessary to handle the vein with care and gentleness as it can be easily torn.

In regard to the anchoring and fixation of either the prolapsed or potentially prolapsed uterus, the strip of cutis must be of adequate length, cut approximately one inch wide so as to allow for narrowing by stretching. No more than a very thin film of epidermis should be removed before cutting. This strip should be carried around the upper portion of the cervical neck between the peritoneal coat and

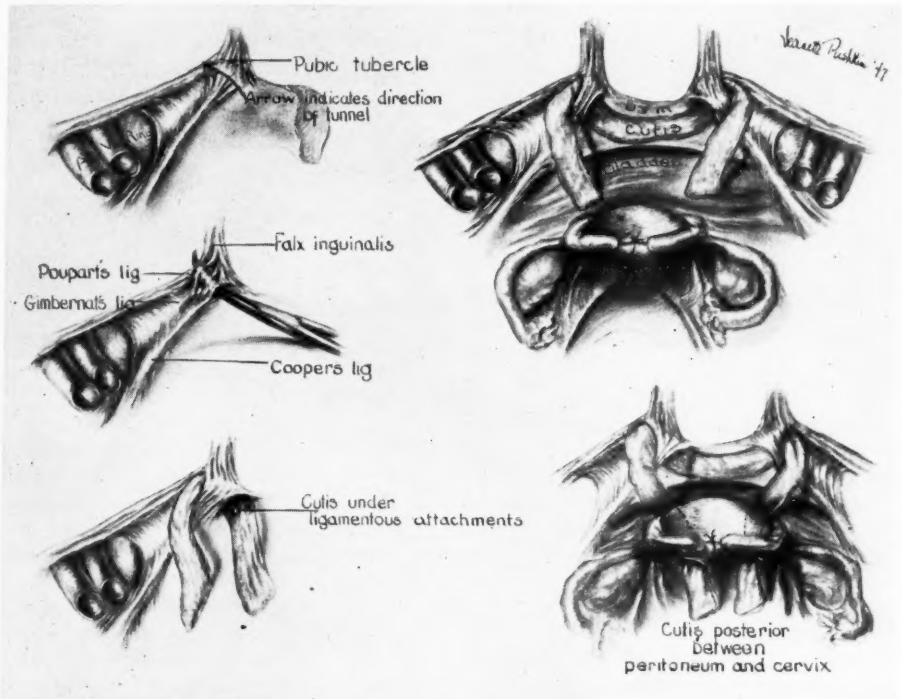

Fig. 1. Details of technic using cutis in suspension of the uterus.

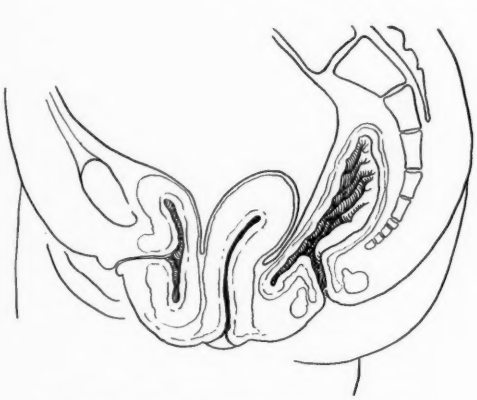

Fig. 2. Prolapse of uterus before operation.

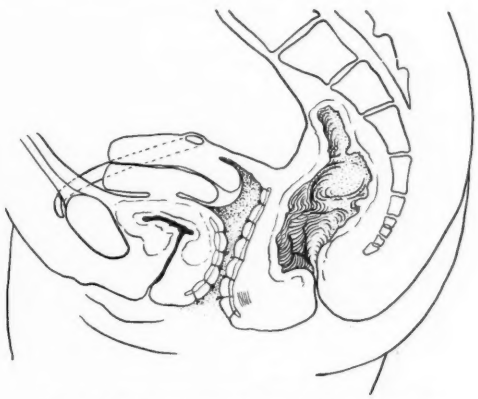

Fig. 3. After cutis graft suspension of uterus.

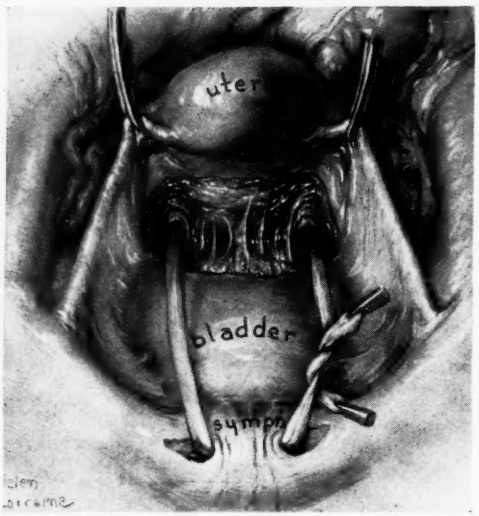

Fig. 4. First stage in cutis graft suspension of uterus.

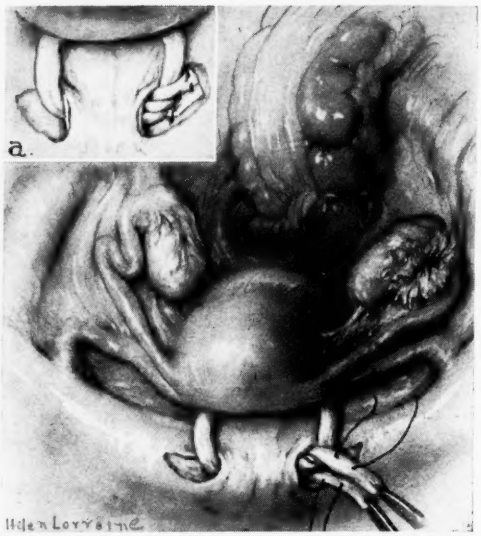

Fig. 5. Final stage, cutis graft suspension of uterus.

the cervical tissues (the cutis strip should not enter the cervical canal). At this point a tunnel is made between the pubic bone and the overlying fibrous tissues in the region of the tuberculum pubis. The tunnel can be readily made with a sharp-pointed heavy, curved hemostat. Through this opening the free ends of the cutis strip are held under firm tension while they are anchored to each other with sutures of heavy stainless steel wire, usually 28 or 30 gauge. The exposed portions of the cutis strip are carefully covered with available protective material such as bladder peritoneum or rectal appendices epiploicae, or both.

Cutting of the Grafts. In this phase of the operative technic the surgeon has considerable leeway. For the narrow strip graft suitable for suspensions, ligation and suturing, a satisfactory strip of cutis may be denuded of its superficial epithelial layer by so simple a device as a sextoblade for a safety razor held either by a special holder or even by a hemostat, or by the dual safety bladeholder being put out by one of our leading surgical instrument houses, the skin surface being held taut with the traditional soap boxes, strips of wood or the Ferris-Smith skin tractors.

When it is necessary to have a wider piece of cutis, the surgeon has a considerable choice of instruments or gadgets, for instance, the Blair-Brown knife, with or without the Marcks attachment, the Ferris-Smith knife, the Caltagirone knife and apparatus, or the Padgett machine. According to Blair and Brown the Padgett apparatus may possess some advantages in cases of infants and small children. The skin edges of the incision usually are closed with vertical mattress sutures; a pressure dressing is applied and usually left in place for about 10 days.

Relative to the implantation of whole thickness skin [8, 9] as a substitute for the cutis graft by a few surgeons, this type of skin graft implantation was used by Bames [10] of Los Angeles many years ago in his plastic work. Acting on his suggestion, I made such an implant about nine years ago and found to my surprise that the skin surface began to fuse with the overlying tissue inside of a week. I wrote Doctor Bames about the result. He said that if I had placed a few drains between the epidermal side of the graft and the overlying tissues it might not have become adherent.

Case 1. Mrs. A. T., white, female, age 60, complained of pain in the left leg due to thrombophlebitis of numerous veins of the left leg and

thigh which had occurred following a week in bed with influenza. Caval ligation was decided on for control of this condition.

Operation was performed by me April 7, 1947. A lower abdominal transverse incision was made and the vena cava exposed retroperitoneally. A short length of this vessel was mobilized by finger dissection. The vena cava then was ligated with a strip of cutis passed twice around it and anchored with double No. 30 cotton thread sutures. At the time of the patient's discharge from the hospital her symptoms were relieved and she stated that she felt quite well.

Case 2. Mr. G. H., white, male, age 64, was admitted to the second medical service of the Charleston General Hospital April 25, 1947, with thrombophlebitis of the right leg and pulmonary infarction of the right side of the chest. In spite of prophylactic treatment with dicumarol the patient's temperature continued to run septically and caval ligation was decided on.

Operation was performed by me April 29, 1947. An incision was made at the level of the umbilicus. The vena cava was exposed retroperitoneally by blunt dissection and isolated at the level of the bifurcation of the aorta. A strip of cutis was carried twice around the vena cava, drawn snugly, and anchored with interrupted cotton thread sutures. The results obtained in this case were quite satisfactory and the patient left the hospital apparently completely well.

To date (Sept. 1, 1947), my colleagues and I have used cutis in 158 surgical cases, as follows: epigastric hernia, 7 cases; abdominal, incisional hernia, 33 cases (2 of these were secondary operations for recurrence); umbilical hernia, 4 cases; excision and reenforcement of chronically infected umbilicus, 1 case; direct and indirect inguinal hernia, 28 cases; diastasis of the buccinator muscle (glass blower's hernia), 1 case; marked bulging of the lower abdominal aponeurosis, 2 cases; herniation of the gastrocnemius muscle,[11] 1 case; prolapse of the uterus in which the cervix was suspended by a strip of cutis (2 of these were secondary operations for recurrence), 42 cases; urinary incontinence in which the urethra was suspended (modified Goebell-Stoeckel-Aldredge type of operation), 1 case; wobbling knee, 9 cases; ruptured crucial ligaments of the knee, 2 cases; fracture of the patella, 3 cases; claw-hand, in which the third and fourth metacarpal bones were approximated, 1 case; fracture of the ulna, 1 case; ankylosis of the jaw, 1 case; sternoclavicular dislocation, 4 cases; luxation of the acromial end of the clavicle, 1 case; contour defect over a depressed area in the frontal bone, 1 case; chronic discharging sinus of the foot in which cutis was implanted after sequestrectomy, 1 case; cutis has been used in 2 cases for stage ligation of the common carotid artery; in 1 case for immediate ligation of the common carotid artery; in 1 case for partial occlusion of the femoral artery for the control of popliteal aneurysm; in 2 cases for ligation of the vena cava for the control of pulmonary embolism; in 3 cases for the replacement of torn dura; as a bridge for support of the bowel in 4 sigmoid colostomy operations; in 1 case for the relief of loss of bowel control (Harvey Stone type of operation (Doctor Abbott of New Orleans has informed me of his use of cutis in a similar case with a good result)).

SYNOPSIS OF RESULTS

In my personal series of 103 cases results remain about the same as at the time of my last report, with 4 minor wound infections, the development of a small area of cellulitis near the operative incision in 3 cases, and moderate serous drainage in 3 cases. In the last named, the sites of drainage were protected with shields of screen wire, 2 of the wounds healing promptly thereafter, the wound in the third case continuing to drain serum for several weeks, but not suppurating. In one other case a hematoma which developed healed promptly after removal of the clot. In the 103 cases there has been 1 death, evidently due to the anesthetic (no autopsy). No graft was lost in any case.

Of the remaining 55 patients in the series of 158 who were operated on by others, there have been 2 deaths, 1 occurring in an obese woman, a poor surgical risk to begin with, who was brought to the hospital at night as an emergency case, suffering from a large, strangulated, umbilical hernia. Since the strangulated bowel was found to be viable after release, a cutis graft repair was decided on and the patient died at the end of the lengthy operation, apparently as a result of shock and exhaustion. In this particular case

Fig. 6. Exophthalmos resulting from arteriovenous aneurysm.

a two-stage operation probably was indicated. No autopsy was obtainable. The second death was due to pneumonia following an operation for cutis graft suspension of the cervix; autopsy in this case disclosed an acute miliary flare-up resulting from an old healed tuberculosis of which no history had been given. Among these 55 cases there have been 2 severe wound infections (both of which occurred in hernia cases) in one of which one of the double thickness grafts used was lost. The hernia has not recurred in either case and, with 2 exceptions, in none of the cases in which cutis graft repair was made.

Results in the 9 cases of wobbling knee repaired by the cutis graft method have been fair to good, generally speaking. One of these occurred on the orthopedic service of Dr. Howard Swart, 3 were done by Dr. Randolph Anderson, and 3 by Dr. George Miyakawa. Through the courtesy of Doctor Anderson 3 of these patients have been heard from rather recently. In one case the result has been excellent; in a second, the result has been good. The third case required a second operation, and this patient now has about 75 per cent function. Results in each of the 2 cases of reconstruction of the crucial ligaments of the knee have been satisfactory. Doctor Miyakawa reports that his results from the use of cutis in knee joint repairs have been fair to good, that the results following

Fig. 7. After cutis graft ligation of common carotid artery.

repair of three sternoclavicular dislocations have been excellent. Doctor Swart has not heard from the knee case in which cutis had been used but says the results in the acromioclavicular luxations have been excellent. Neither has Doctor Swart heard from a soldier who had a chronic recurrent dislocation of the shoulder and who had a repair of the Henderson type in which cutis was used instead of tendon. The result in the single case of total ankylosis of the jaw has been excellent. When last heard from (Sept. 1, 1945), through the medium of her mother, the patient had had no difficulty in making a wide bite or in masticating her food since her operation in July 1943.

CONCLUSIONS

The operative mortality of 1.96 per cent in our cutis graft cases, as previously reported, remains the same; likewise, the recurrence rate of hernia has varied but little. Cutis is most valuable perhaps in the reenforcement and repair of incisional hernia. Its value for the suspension of the cervix in uterine prolapse probably would come next. It has been found to be ideal material for the replacement of dura, for the ligation of the vena cava, and for the common carotid and other large arteries. For ruptured ligaments of the knee and for the reconstruction of joints its advantages are believed to have been definitely proved. For stage or permanent ligation of the aorta it is believed to be of value.

SUMARIO

La mortalidad operatoria de 1.96% en nuestro casos de engrafte del cutis ha sido lo mismo que en los casos que hemos reportado en articulos previos. Lo mismo se puede decir del porcentaje de recurrencias de nuestras hernias. El cutis o dermis es el agente mas valuable en el reparamiento de la hernias incisionales. Su valor en el tratamiento del prolapso uterino probablemente sera reconocido con el tiempo. Se le ha encontrado el ser un material ideal en el tratamiento de los defectos de la dura madre, en la ligacion de la vena cava, la arteria carotida comun y otras arterias de calibre largo. En cambio su uso en la ruptura de los ligamentos de la rodilla o en reconstruccion de otras coyonturas tiene desventajas definitivas que han sido comprobadas. En la ligacion de la arteria aorta se cree ser de valor.

RIASSUNTO

La mortalita' operatoria dell' 1.96% nei casi di trapianto della pelle e' rimasto quale era stata riportata in articoli precedenti. Anche la percentuale di recidive nei casi di ernia e' rimasta presso a poco immutata. La pelle rappresenta il materiale piu' adatto per riparare e rinforzare le ernie postoperatorie: per la sospensione del collo dell'utero nei casi di prolasso uterino. E' un materiale ideale per la sostituzione della dura; per la legatura della vena cava, della carotide comune e per altre arterie di grosso calibro. L'A. ritiene che la pelle non sia invece adatta per la ricostruzione delle articolazioni e per riparare i legamenti del ginocchio. Puo' trovare un' indicazione nella legatura a tappe o nella legatura permanente dell'aorta.

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Tantalum Wire in Surgery*

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THE search for the best suture material is still on. Among the nonabsorbable materials, silk and cotton have had the preference, particularly in layers of tissue where the strength of the approximated borders (fascia, muscle) is put to a stretch immediately after operation. The sutures have to stand the intermittent pull on every motion of the body. For weeks after operation fibrous tissue formation across the united incision has not progressed sufficiently to avoid separation. Howes [7] and Harvey [5] have shown that union is minimal for the first four days following laparotomy. Fibrous tissue increases up to the twelfth day. For the first five days the sutures hold the wound together. Separation due to too early absorption of catgut is probable. A zone of reactive and degenerated cells around the catgut is noted. When using silk or cotton this is less marked. The least reaction is encountered around tantalum wire. It is practically absent. Jenkins reports the formation of white fibrous tissue in scars where wire had been used for closure. The wound edges showed a firm union, resisting separation by pull with retractors. Two weeks after operation a scalpel was necessary to divide the layers. Preston reports that an upper abdominal incision closed with strong catgut could be pulled apart easily 14 days after operation, exposing grey friable poorly vascularized wound edges. This prompted him to advocate the use of nonabsorbable suture material. When using absorbable suture material, slow separation of the united borders will cause weakening of the final scar and subsequent herniation. On the surface of the body it will result in a widened scar with possibly some keloid formation instead of a fine linear scar. In using absorbable material like catgut in the same layers, the danger of separation is much greater since even chromic catgut, at times, gives way within a few days in tissue under tension. It is probably due to a variance in the formation of certain chemicals in the tissue fluid of a given person which dissolves the catgut more quickly. Even chromic catgut can become weak early and break. When using nonabsorbable suture material like silk or cotton, this danger is eliminated. Another factor enters the picture then which makes these two materials undesirable. The danger of infection within or around this foreign body with formation of a fistulous tract leads to a persistent purulent discharge until the suture material, acting as a foreign body, is eliminated by nature. If suppuration persists, curetting or a secondary major surgical procedure becomes necessary.

Kocher and Halsted realized the shortcoming of catgut. Tetanus as a source of infection is now well under control although the chemicals used in the processing of catgut are not beneficial for its tensile strength. Early disruption by digestion even of chromic catgut is still a factor. Proteins liberated from decaying catgut sometimes give rise to allergic reactions (Kraissl and Babcock). Kocher and Halsted therefore, used silk only in clean surgical wounds. They stressed the fact that the exudative tissue reaction is much less marked around silk stitches than when catgut is used. This has been confirmed by Harvey and Howes.

All the facts mentioned above prompted the search for another materal nonabsorbable in nature and inert in the tissue. Tantalum seemed very promising. The use of metal as suture material is not new. Silver, aluminum, brass and various steel alloys have been used in surgery at one time or another. According to Babcock,[1] J. P. Mettauer in Virginia was the first to use lead wire to close vesicovaginal fistulas (32 cases). J. Marion Sims used silver wire for the same operation, with success. The wound healed by primary intention. In 1932 Babcock introduced alloy steel wire for sutures. Using the same thickness the tensile strength was much greater for wire than that of any other material. The knot stayed firmly tied even

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when the wire was cut close to the knot. When buried in the tissue, Babcock found no polymorphonuclear exudate or any noticeable tissue reaction in contrast to silk or catgut. At reoperation the wire looked like new without evidence of oxidation. It was embedded in dense fibroblastic tissue. Even when used in infected areas no abscess results around wire sutures. Granulation tissue is formed around them and subsequently replaced by dense fibrous tissue without sinus formation.

A further advance in the use of metal sutures was the introduction of tantalum in 1940 by Burke [2] of Vancouver and Carney and Burch [3] of Vanderbilt University. Tantalum is an element discovered in 1802 by Ekeberg in Sweden after prolonged, tedious efforts. This prompted him to call this new element after Tantalus, the ill-fated son of the mythological Greek god, Zeus. It is a metal having the chemical property of glass and the physical character of steel. It is inert to all inorganic acids except hydrofluoric, fuming sulfuric acid, and many of the organic acids in high concentration. It is biologically inert to animal and human tissue.

Until 1922 only small amounts of tantalum were produced in Germany. In 1922 a new method of production was evolved. At one time the only mine producing tantalum was located in Western Australia. More recently sources became available in this country and abroad.

Tantalum-containing ore cannot be refined by smelting. A special method of processing is necessary to obtain pure tantalum powder. Tantalum is bluish gray. In rolled polished sheets it has a metallic appearance similar to platinum. The metal powder is pressed into bars and sintered in a vacuum at a temperature approaching the melting point (2996 degrees C.).

In experimental studies with tantalum over a period of 18 months Burke found tantalum to be inert with double the strength of steel, very malleable, and noncorrosive. It did not liberate toxic substances when in contact with tissue. Kiskadden [9] reports that substitution of tantalum for silk resulted in reduction of induration, redness, and infection. White and Hamlin [15] noticed that silk sutures produced tissue irritation even under the most favorable circumstances, the strands being gradually pushed apart by dense masses of fibroblasts. Tantalum wire (0.003 inch in diameter) was found by them to be less irritating, easier to tie than other available metallic suture material and without any tendency to slip on the first half hitch of a square knot.

I have been using tantalum wire (0.007 inch in diameter) as interrupted stitches with great satisfaction in all layers of tissue which need good approximation to guarantee a resistant scar. Bearing Langer's line of minimal tension in mind, I use interrupted tantalum wire stitches in approximating muscle to muscle and fascia to fascia in all incisions. When using wire (0.007 inch in diameter) in muscle great care has to be taken to avoid any crushing by leaving the wire loop wide enough to prevent interference with the circulation from the secondary edema occurring one to two days after suturing. When suturing separated fascia layers a small bite is taken with loose but accurate approximation. Until recently I have been using chromic catgut for closing the peritoneum. Now I have started to use wire for all layers when closing abdominal incisions. This has been made possible by the introduction of braided tantalum wire. This braided wire corresponds to catgut 000 in thickness, but has the tensile strength of the standard monofilament wire (0.005 inch in diameter). It is much more pliable than the standard monofilament wire and resembles silk in its handling. In the tissue it has the same characteristics as the original tantalum wire. It can be used as a continuous stitch for closing the peritoneum. The only disadvantage observed is in the tying. Occasionally the first knot slips if not fixed with an instrument (needleholder) while the second knot is applied. According to Preston standard tantalum wire, when examined under the microscope after stretching, shows numerous fine transverse ridges which act as teeth, thus increasing the friction and preventing disruption of the knot. When using braided wire this lengthen-

ing of the wire when being stretched is apparently not as marked. This explains the occasional loosening of the first knot when braided wire is being used. The lack of elongation in braided wire is due to the use of wire .002 inch in diameter in the braiding. If the square knot is tied without rolling, the first throw will not slip. If when making the second throw, one draws the wire down snugly, one can cut to the knot without any difficulty and without fear of slippage.

Tantalum wire can be used with great advantage as a subcuticular stitch. Its inertness in the tissue allows one to leave it in place longer before removing it. In doing so it guarantees a resistant scar.

The use of fine tantalum wire (0.005 inch in diameter) in subcutaneous tissue in the form of interrupted small bite stitches proved particularly advantageous in thyroidectomies using Kocher's transverse incision. In doing so the interrupted wire skin stitches can be removed after 24 to 48 hours. A subcuticular wire stitch might prove advantageous following radical mastectomy. Subcutaneous tantalum wire stitches are preferable to silk which I have used routinely for years. The wire has never given rise to stitch abscesses. The wire stitches guarantee approximation of the skin without border necrosis. On very thin persons, however, the knots later have sometimes protruded over the skin edges of the scar. When this happened, removal of stitches was an easy matter. Even after months no infiltration or suppuration was present as encountered when using silk.

Hayes and Burr,[16] using wire for sutures in abdominal wounds, report rapid closure, decreased healing time and no dehiscence in over 250 abdominal closures. Most cases concerned one-stage abdominoperineal resection, or colostomy in cases of inoperable carcinoma of the rectum or colon.

In intestinal surgery I use tantalum wire in the form of interrupted stitches on the outer sero-serosa layers (0.005 inch in diameter). On reoperation and in one case at autopsy, 13 months after side-to-side ileotransversostomy, the absence of any adhesions around the site of operation was striking. This finding prompted me to use interrupted fine tantalum wire for closing denuded serosa surfaces within the abdominal cavity. The use of a wire stitch to invert the crushed appendix base securely will prevent leakage and peritonitis.

In wounds potentially infected like colostomy the use of tantalum wire assures a resistant scar without sinus formation as encountered when using silk or cotton. The use of chromic catgut in these cases would result in premature dissolution of the catgut and subsequent hernia formation.

The use of tantalum wire in abdominal surgery as indicated above enables me to observe early ambulation in all patients 24 to 48 hours after operation. This reduces the postoperative vomiting, lessens gas distention, and prevents thrombus formation. Vickers [14] stresses the advantage of wire and early ambulation in war-time surgery. A definite decreased tissue reaction, and increased incisional security are conspicuous with wire as suture material.

In hernioplasty (Bassini, Halsted) I use interrupted tantalum wire to great advantage in preference to silk. In my experience muscles sutured properly to fascia without crushing the muscle will heal with dense fibrous tissue, provided nonabsorbable suture material is used. Silk has been successfully used by Kocher and Halsted. Tantalum wire is now the superior material for any hernioplasty. Kaufman [8] used wire in herniorrhaphies and observed better wound healing.

In panhysterectomy I reinforce the closed vaginal fornix suture with interrupted wire and include the round ligaments in it to assure a secure suspension of the fornix.

In neurologic surgery tantalum wire is used with great success in the repair of peripheral nerves. Spurling, Pudenz,[12] and Schnitker [13] used tantalum (0.003 inch in diameter) as through-and-through sutures in end-to-end anastomosis with minimal foreign body reaction and little interference with the down-growing axones. Pudenz, in experimental studies, inserted silver and tantalum ribbons into the cerebral hemisphere of cats. The animals were sacrificed at intervals of 10 to 148 days. Tantalum clips for hemo-

stasis in the meninges or in nervous tissue showed minimal encapsulation by fibroblasts and neuroglia fibrils. Silver clips, on the other hand, produced an intense inflammatory reaction leading to dense collagenous connective tissue formation similar to the findings in cerebral abscesses.

Powell [11] reports excellent results when using wire in the closure of urologic wounds with the stay suture technic. The suture includes skin, muscles and fascial layers down to the perinephric layer and out the other side in reverse order. The sutures are placed every ½ to 1½ inches. Any drains or tubes are brought out through the posterior end of the wound. All sutures are placed before any are tied. For proper approximation interrupted dermal may be used in the skin. The first sutures were removed after 8 to 10 days, the last one 4 to 6 days later. Quick healing, minimal tissue reaction and good functional results were uniform in Powell's series of 37 cases.

In industrial surgery tantalum wire is the material of choice in all instances where silk or cotton used to be advisable. Wilson and Kaplan [16] report successful use of wire in tendon and nerve injury. They stress the fact that the tensile strength of tantalum in tendon suturing permits early active motion with a minimum of tissue reaction. Olson reports good results with tantalum wire in hand injuries.

The good results with tantalum wire are obtainable only when the following fundamental surgical rules are observed:

1. Gentle handling of tissues with minimal crushing by clamps to avoid subsequent necrosis of tissue and possible site for infection.

2. Exact hemostasis to prevent hematoma formation, another factor for infection.

3. Proper application of sutures in respective layers, thus avoiding creation of empty spaces with formation of seroma. This might again be the source of infection although liberal and uniform sprinkling of sulfa powder throughout the wound or irrigation with normal saline solution, will greatly reduce this danger.

When uniting separated muscle fibers or adapting muscle to fascia, loose approximation is essential. This will avoid the ischemia resulting from the secondary edema in any traumatized muscle with subsequent necrosis and weak or nonunion of the suture.

The use of diathermy or preferably short wave is in my experience a very valuable adjunct in the healing of wounds, inasmuch as it secures persistent arterial hyperemia conducive to rapid healing. Ebeling showed that elevation of temperature increases the rate of healing. He compares the effect of temperature on metabolism and the effect of temperature on chemical reaction which are fundamental to the healing process of wounds.

In all my operations where I used tantalum wire, short wave could be used with no detrimental after-effects. The stimulating action on the reparative process of the wound was quite evident. Together with early ambulation it shortens hospitalization and the length of disability.

Etter and associates,[4] in extensive experiments on animals, proved that tantalum wire embedded in tissues is no contraindication to the use of diathermy or shortwave. No significant difference between the temperature on the side containing the metal and that on the control side were noted after shortwave exposure within therapeutic dosage. Histologic examination of tissues contiguous to the metal did not disclose any significant destructive effects from shortwave. When present they were the result of excessive heating and were on the control side just as pronounced as on the side where the tantalum had been implanted. Lion [10] confirmed the findings of Etter.

The introduction of braided tantalum wire with its greater ease in handling and great tensile strength in fine size, eliminates a disadvantage of the original monofilament tantalum wire.

SUMMARY

Tantalum wire in surgery proves to be a superior nonabsorbable suture material. It is inert in the tissue and assures firm closure of the wound even in the presence of infection. The tensile strength of the wire suture remains constant and allows early ambulation. Shortwave treatment is a valuable aid

in hastening healing and is not contraindicated when using tantalum wire if the proper technic is observed.

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Cotton as Suture Material in Combination With Catgut*

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IT is not our intention to suggest that cotton is the ideal suture material, or that the technic we have been using is the only correct one. On the other hand, in more than 400 operations where cotton was used, there were no complications such as evisceration, purulent or serous discharge from the wound, or extrusion of cotton knots. For these reasons the presentation of this paper seems to be justified in order to throw some light on the newly-revived controversy on the use of cotton.

The main emphasis will be placed on two points:

1. That cotton may be used as suture material safely and advantageously.

2. That cotton may be used simultaneously with catgut without ill effect.

Before going into a detailed discussion of the cases where cotton was used in our series, it seems appropriate to say a few words in general about our conception of the use of suture material. As long as the surgeon had to resort to heavy catgut in order to compensate for the lack of tensile strength, a fair amount of tissue reaction, and even an occasional infection, were inevitable. Even though this was generally of no serious consequence, a number of surgeons advocated the exclusive use of nonabsorbable suture material. They could prove by a large series that the number of infections was lower with the exclusive use of silk or cotton; that the incisions healed with less reaction, and that the general appearance of the wounds was better than with the use of catgut. But they also had to admit that if infection did set in, sinus formation and extrusion of suture knots could occur.

The objection to the combined use of absorbable and nonabsorbable suture material was unanimous, the rationale being that nonabsorbable material in a potentially irritated wound would lead to more irritation, and in an infected case the sequelae would be more serious than with either type alone.

This was the situation until the increase of tensile strength made possible the use of finest suture material. Today there is little tissue reaction and danger of infection with the use of very fine catgut, and the foreign body reaction and capillarity of nonabsorbable sutures are greatly minimized.

On principle we still prefer to leave behind as little foreign material as possible, but we thought we could benefit from the combined use of both materials, that is, from the holding and nonirritating quality of cotton and the absorbability of catgut.

In spite of the general attitude we did not hesitate to use absorbable and nonabsorbable material in the same wound. We felt that with the careful employment of both materials and the proper technic, the danger would be negligible.

In every case our plan was to evaluate the individual need for nonabsorbable sutures or the advantage of their use; otherwise we would use catgut as before. This strict and critical attitude toward the employment of cotton will explain why many operations were still performed with the exclusive use of catgut. On the other hand, the increasing usefulness of cotton is clearly reflected by the doubling of operations from year to year where this material was used.

At this point it seems appropriate to state briefly the main principles of our operative and suture technic. This seems important because we strongly believe that the contradictory reports on different suture materials are due to a difference in technic rather than to the suture material per se. We are less concerned about breakage than tissue reaction to suture material, which we feel is the main cause for weakening of a suture line. We are also convinced that heavy chromic gut rather than fine sizes will lead to evisceration.

* The cotton sutures used are the product of Gutebrod Bros. Silk Co., Inc. Comparative sizes are: Cotton O = thread size 40; Cotton A = 30; Cotton B = 20.

Therefore we use the finest possible sutures.

The same principle applies to ligation of vessels. Secondary hemorrhage may be due to slipping of a ligature, but if it occurs around the eighth to tenth postoperative day or later, we attribute it to the fact that the whole distal end of the ligated vessel sloughed off. This may well happen due to severe tissue reaction when the vessel is tied with heavy or multiple chromic ligatures.

In order to obtain clean, reactionless healing it is important to reduce as much as possible the amount of crushed tissue. Therefore, whenever feasible we use small, pointed clamps. Even if we are able to spare only one square millimeter of tissue per clamp, the amount saved at the end of the operation may be considerable. We carefully avoid mass ligatures, large bites of tissue, heavy needles, suturing under tension, and placing sutures too close together.

Even anesthesia plays its part because poor relaxation during closure may force the surgeon to use more and heavier sutures, which in turn may alter the final result.

Today it is a well known fact that good wound healing depends as much on reliable sterility of operating room requisites and technic as on the patient's balance in serum protein, electrolytes and vitamins. Furthermore, the postoperative treatment and care are considered as important as the surgery itself.

Only if all these basic rules are strictly observed, if possible by one and the same team during the entire period of trial, can the value of a particular suture material be judged correctly.

Below is a tabulation of cases in which cotton sutures were used.

In 1944 when we started to employ cotton as suture material, it was used during the entire year for the repair of hernias only. It was our thought that in herniorrhaphies nonabsorbable material would be most desirable, and further, relatively little catgut would be needed since only a few small vessels are encountered. If there was any danger from the combined use of absorbable and nonabsorbable suture material, it should be a very slight one. Consequently we used cotton for the hernial repair proper and catgut for tying off the sac and ligating the vessels.

Operation	1944	1945	1946
Hernia repair, all types	51	83	74
Cholecystectomies		6	52
Cholecystogastrostomy			1
Esophagogastrostomy	1		
Gastroenterostomy		1	4
Subtotal Gastrectomy		2	4
Transthoracic Gastrectomy		1	1
Transthoracic Esophago-Gastrectomy			1
Exploration of the Duodenum			1
Duodenectomy			1
Intestinal Obstruction			2
Intestinal Resection		1	7
Miles Resection of Rectum			4
Colostomy			4
Closure of Colostomy		1	3
Exploratory Laparotomy		2	8
Diaphragmatic Eventration		1	
Abdominal Hysterectomy		3	37
Oophorectomy			1
Repair of Cystocele	1	3	4
Perineorrhaphy		4	4
Gilliam Crossen Suspension			7
Olshausen Suspension	1		7
Nephrectomy			1
Transplantation of Both Ureters			2
Cystectomy			1
Exstirpation of Pilonidal Cysts		11	5
Talma Morrison Operation			1
Laceration of Fascia of Biceps			1
Total: 411	54	119	238

From the start we did not extend the use of cotton to the repair of all types of hernias. One type where we desisted from the use of cotton is the congenital hernia of infants and children. High ligation of the indirect sac is practically all that is needed for permanent cure. There is no need for displacement of cord structures or for any type of complicated repair. There is also no need for nonabsorbable suture material. The other type is the extremely large traumatic or incisional hernia. To be sure, we have successfully repaired quite a number of traumatic and incisional hernias with the use of cotton, but these were of small or medium size. For the largest ones we used tantalum wire. Its use has many disadvantages in comparison with cotton, but

it has certain merits which will not be discussed in this paper.

When after one year of trial every wound had healed by primary intention and no complication had occurred after many months of observation, we started to expand the use of cotton to many more types of operations. Whatever the operation was, we applied the same principle as for hernia repair, namely, to use cotton only in those layers where it was thought to be more advantageous than catgut. As satisfied as we were with our new technic, we have not applied it as a rigid rule, and the same operation was performed sometimes with, and sometimes without cotton.

It would go far beyond the limits of this paper to give the exact account of sutures used in every single operation. We will name instead three procedures where we have used cotton most often and in this way give a general idea as to how this material has been used.

1. Repair of Hernias.
   Hernial sac: plain 0 or chromic 00, single or double, depending on the size.
   Ligation of vessels: chromic 00 to chromic 0000.
   Bassini repair: cotton 0 or cotton B.
   McVey repair: cotton B.
   Plication of transversalis fascia: cotton 0.
   Plication of direct sac: cotton 0 or chromic 00.
   Closure of external oblique aponeurosis, with or without imbrication: cotton 0.
   Mayo repair: cotton 0.
   Skin closure: cotton 0.
2. Closure of Abdomen.
   Peritoneum: chromic 000 double.
   Fascia: cotton 0.
   Skin: cotton 0.
3. Gastroenterostomy, Gastric Resection, Resection of Intestine, Enteroentero Anastomosis.
   Anterior and posterior serosa-serosa sutures: cotton 0.
   Inner lockstitch and Connell stitch: chromic 000 to chromic 00000.
   Closure of duodenum: chromic 000 lockstitch; 2 rows of cotton 0.

The main objection to cotton, as voiced by many surgeons, is its use in cases with frank or potential infection. The only cases in our series where severe infection was present were 8 cholecystectomies for empyema and perforation. We experienced no untoward reaction from the use of cotton for fascial and skin closure in these 8 cases. On the other hand, neither did we have a single complication in a large number of operations, i.e., in closure of colostomies, intestinal resections, and in open anastomoses where cotton was definitely exposed to infection.

Finally, we employed cotton in many operations where we previously had resorted to a heavier chromic gut of slower absorption. For example, routinely we use only catgut for vaginal surgery. In the repair of 8 large cystoceles and rectoceles, we sutured the deep layers with cotton 0, assuming that this would lessen the danger of recurrence. The superficial sutures were chromic 000 as usual. This technic also had the advantage that the patients had much less perineal discomfort postoperatively than with the use of heavy chromic gut. This lack of local reaction by substituting cotton for heavier catgut was one of the main advantages of its use. It was appreciated by both the patient and the surgeon. The wounds actually healed better inasmuch as there was no induration, irritation, or accumulation of serum, so frequently seen with catgut. The patients complained of less pain in their incisions, yet the total amount of nonabsorbable suture material used was very small.

For the past three years we have been ambulating our patients within the first 24 hours after surgery. This was done irrespective of the suture material used at the operation. There was no ill effect from this procedure, and we are under the impression that the group of patients whose laparotomy wounds had been closed with cotton moved around more freely than those where only catgut had been used.

As stated in the beginning of this paper, we do not intend to suggest the use of cotton in combination with catgut as the best and only technic. Not only do we realize that other surgeons may have equally good

results with different suture materials, but we also may change again in the future to a new and more promising technic if we think we are able to improve our results. At the present moment we are well satisfied and like the combination of material in use better than the pure catgut technic which the senior author has used in thousands of operations with very good results. But whatever the suture material might be, we want to emphasize that there is no substitute for the most careful and atraumatic technic while operating, and for the most thorough preoperative and postoperative management.

SUMMARY

During the past three years 411 operations were performed using cotton in combination with catgut as suture material. These included hernial repair, gynecologic operations, and intestinal resections and anastomoses.

There was not a single incident of untoward effect of cotton. All wounds healed by primary intention, with good cosmetic result.

Use of Portacaval Shunts in the Management of Portal Hypertension

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THE cycle is complete. In 1943 Whipple [1] and Blakemore [2] performed the first successful portacaval shunt for portal hypertension, employing the vitallium tube technic of Blakemore and Lord.[3] After some 20 patients with portal hypertension due to cirrhosis of the liver or Banti's syndrome had been operated upon in a similar fashion Blalock [4] redirected interest to the suture technic for the anastomosis of the end of the portal vein to the side of the inferior vena cava and the end of the splenic vein to the side of the renal vein. From the time of Nicolai Eck,[5] who first performed the operation experimentally, many attempts to suture the portal vein or some of its branches had been made. All of the reported cases checked by autopsy proved unsuccessful. In a careful series of experiments one of Blalock's associates, Johns,[6] demonstrated in dogs that an end-to-side suture anastomosis of the splenic vein to the renal vein was successful more frequently than an end-to-end suture anastomosis, which in turn proved superior to the end-to-end vitallium tube technic. This experimental data, plus the facts that end-to-side splenorenal anastomosis preserves the left kidney and that in the vitallium tube method 2 cm. more of vein is necessary for a successful anastomosis than with the suture method, have lead to the current practice of suturing the veins employed in the shunts in an end-to-side fashion.

Let us examine the two basic operative technics for the relief of portal hypertension. Figure 1 shows diagrammatically an anastomosis between the portal vein and the inferior vena cava using a vitallium tube. As stated earlier, we now join the two vessels by a continuous everting mattress suture similar to the one used for joining the ends of the aorta after excision of the stenosed area in coarctation of the aorta (Fig. 2). This method is also precisely the same as the one Dr. Blalock has employed so successfully in his operation for congenital pulmonary stenosis in which he anastomoses the end of the subclavian or innominate artery to the side of the pulmonary artery. Figure 3 shows diagrammatically the procedure of splenorenal anastomosis which is used in patients with Banti's syndrome (extrahepatic portal block) and in some cases of cirrhosis of the liver. We now leave the kidney in situ and join the end of the splenic vein to the side of the renal vein.

While we are still on the subject of technic let us examine another operative procedure which is of value in the management of intractable ascites due to cirrhosis of the liver. It is useful in patients who are poor operative risks and who could not possibly survive an operation of the magnitude of a portacaval anastomosis. The operation referred to was ably described by Crosby and Cooney [7] in October 1946. They make no claim of originality but did modify the construction of the button so that omentum cannot plug its in-

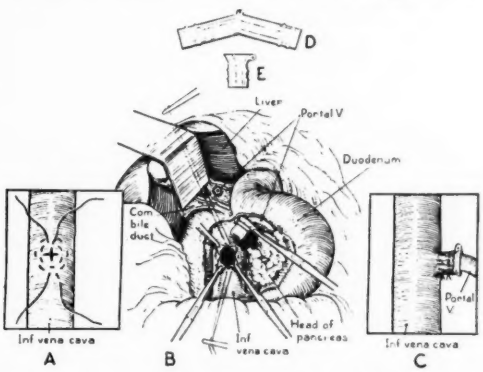

Fig. 1. A, illustrating placement of the pursestring sutures in the inferior vena cava and the centering of the cruciate incision for the implantation of the vitallium tube bearing the portal vein. B shows the tube bearing the portal vein about to be introduced through the opening in the vena cava. C, the completed anastomosis. Note the wall of the vena cava is drawn well up on the vitallium tube. D, a tube suitable in design for vein graft bridging. E, a late design double-ridge tube with a holding tab. Instead of using the vitallium tube method of anastomosing the end of the portal vein to the side of the inferior vena cava we now use the suture method of anastomosis.

ternal opening. Crosby and Cooney reported 6 cases that were moderately or markedly improved following operation. The principle of the procedure is to permit the ascitic fluid to escape from the peritoneal cavity through a hollow glass button to a subcutaneous pocket where it is absorbed as edema fluid. In this way the patient is spared repeated paracenteses and the protein content of the fluid is not lost. The author had occasion to see in consultation a cirrhotic suffering from intractable ascites who had been subjected to the Crosby-Cooney operation. The patient had been greatly relieved for a period of two months but then ascitic fluid began to reaccumulate rapidly, necessitating repeated paracenteses. Presumably the lymphatics in the subcutaneous fatty tissues had become blocked. In discussing the case with Dr. Irving S. Wright he pointed out the fact that fascial removal was desirable in procedures designed to relieve advanced lymphedema of the leg. When the deep fascia was removed the lymphatics of the muscles were valuable in the absorption of edema fluid. The author [5] has recently described an operation which modifies the Crosby-Cooney procedure by adding a widespread fasciotomy of the abdominal muscles to the area where the button is inserted. The first patient operated upon by this method will be discussed later.

Portal hypertension may be due to intrahepatic or extrahepatic block. The classical example of intrahepatic block of the portal vein is Laennec's cirrhosis. Extrahepatic block (Banti's syndrome) may occur in the portal vein or in the splenic vein. The block may be due to thrombosis in, or cavernomatous transformation of, the portal vein. Normal blood pressure in the portal system varies between 80 to 100 mm. of water. In cases of portal hypertension the pressure usually is in the neighborhood of 300 mm. of water and occasionally has been observed to be as high as 600 mm. Pressures are taken at the time

Fig. 2. Taken from a drawing by Gross and Hufnagel (*New England Journal of Medicine* September, 1945), showing their method of joining the cut ends of the aorta. A continuous everting mattress suture bringing intima to intima is placed. In the end-to-side anastomosis of the splenic and renal veins we interrupt this continuous mattress suture at three points, using three interrupted mattress sutures; 00000 Deknatel silk on an atraumatic needle is used.

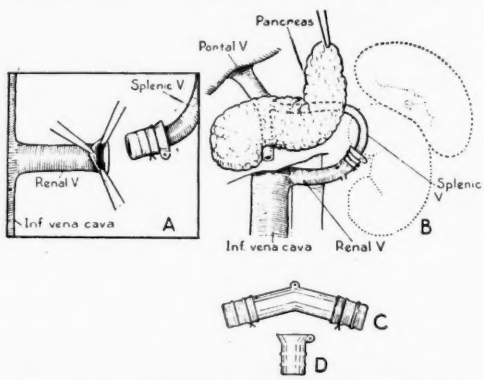

Fig. 3. A, illustrating the method of everting the renal vein for the introduction of the vitallium tube bearing the splenic vein. The clamp on the flanged portion of the vitallium tube for its guidance and the rubber-shod clamps upon the splenic and renal veins have been omitted. B is a semidiagrammatic sketch of the completed anastomosis. Note the placement of the ligatures upon the vitallium tube. C, a vitallium tube with a vein graft mounted. D, an improved design of vitallium tube for end-to-end or end-to-side splenorenal anastomosis. There are two tying ridges placed 2 and 4 mm. respectively from the end. Note the tab on the flange for the application of a holding clamp. Instead of the vitallium tube method of anastomosing the splenic and renal veins we now use the suture method of anastomosis, joining the end of the splenic vein to the side of the renal vein.

of operation from one of the branches of the epiploic or coronary veins and a simple venous pressure apparatus is all that is necessary.*

Clinically, portal hypertension manifests itself in one of two ways. Because of partial or complete block of the portal or splenic vein a widespread collateral circulation develops

A moderate number of cirrhotics, however, owe their ascites not to low levels of serum albumin but rather to the strangulation of the tiny radicles of the portal vein in each portal space by the proliferative fibrosis, so much a factor in the pathologic picture of portal cirrhosis. It is in this group that

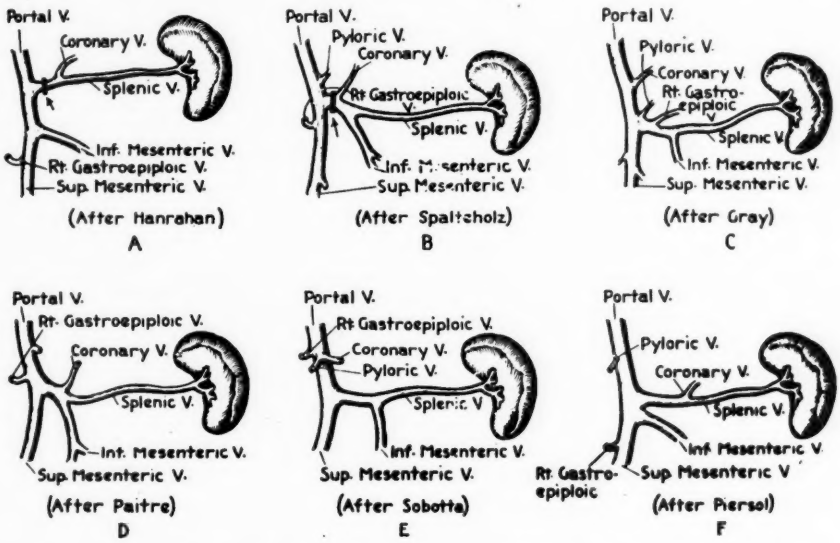

Fig. 4. Variations in the anatomic pattern of the portal system, illustrating how an obstructive factor of the same site in different individuals may result in marked differences in clinical behavior.

and part of this collateral system is evidenced by the presence of esophageal varices. Hemorrhage from one of these varices is one of the predominant symptoms of Banti's syndrome and is also frequently noted in cases of cirrhosis of the liver. It is also of importance clinically that massive and repeated hemorrhage is the most common cause of fatalities in Banti's syndrome and probably next to cholemia is the most frequent cause of death in patients suffering from cirrhosis of the liver. The second clinical sign of portal hypertension is ascites. Now many patients with cirrhosis have ascites largely due to low levels of serum albumin and comprehensive and intensive therapy to improve liver function along modern lines will raise the level of the albumin and eradicate the ascitic factor.

intractable ascites is noted in spite of the best of dietary management over prolonged periods.

At the present time the indications for surgery and the technic employed are as follows: (1) In patients with Banti's syndrome who have hemorrhaged and/or have evidence of esophageal varices we perform a splenorenal end-to-side anastomosis associated with the removal of the spleen. We believe that splenectomy alone should *never* be employed for the treatment of Banti's syndrome without proof that the block is in the splenic vein distal to the coronary vein. In Figure 4 the anatomy of the portal venous system is diagramed by six different authors. We see that there is considerable variation in each drawing. The importance of this fact is that the coronary vein may vary widely in relation to the site of thrombosis or block and if the

* Made by Becton-Dickinson. A Lindemann needle is also useful.

coronary vein enters on the hepatic side of the block then simple splenectomy will be curative. Of course, such a patient would not give a history of hemorrhage but rather would exhibit the other signs of Banti's syndrome, i.e., splenomegaly, leukopenia, anemia and thrombocytopenia. If a splenectomy has already been performed on a patient with Banti's syndrome and the block is proximal to the coronary vein, then secondary operation to anastomose a branch of the portal vein to the inferior vena cava or one of its branches is much more difficult. (2) The second indication for surgical intervention is in patients with cirrhosis of the liver who have hemorrhaged and/or have esophageal varices. Two operative procedures are available in this instance: either an anastomosis between the end of the portal vein and the side of the vena cava or an anastomosis between the end of the splenic vein (after splenectomy) and the side of the renal vein. The former operation is more difficult technically but does provide for a larger shunt. At present we favor the splenorenal procedure. (3) The third indication is intractable ascites due to cirrhoses of the liver. If the ascites is associated with esophageal varices then a splenorenal shunt should be employed. But if there is no history of hemorrhage and no evidence of esophageal varices then the modified Crosby-Cooney button operation with fasciotomy should be utilized.

What are the contraindications to portacaval shunts? First, evidence of an active hepatitis superimposed on the cirrhotic process. If there is significant jaundice, if the cephalin flocculation and thymol turbidity tests are strongly positive, and if there is prolongation of the prothrombin time which fails to respond to vitamin K,[9] then such a patient is a poor operative risk. With careful treatment including prolonged bed rest occasionally the hepatitis will subside and the patient may become a suitable candidate for surgical intervention.

A second contraindication is any patient who is a poor surgical risk on grounds other than hepatic insufficiency, such as poor cardiac reserve, advanced age, or poor renal function. Both of the operative procedures for the establishment of portacaval shunts are of considerable magnitude, usually lasting from 4 to 7 hours and, because of the marked collateral circulation, require from 1500 to 4000 cc. of blood during the operation. On the other hand the button operation is simple to do, requires less than one hour to perform and is tolerated well by poor risk patients.

Statistical analysis of the results of portacaval shunts is not possible as yet because of the relatively small number subjected to operation and because of the short term follow-up. As is clearly evident surgical intervention is carried out only on patients whose outlook without operation is extremely grave. It is well known that patients with cirrhosis and patients with Banti's syndrome who have had massive hemorrhages or intractable ascites have a desperate outlook when treated conservatively. For this reason any procedure which may lower the level of the portal hypertension is worthy of consideration. Measurements of the portal pressure after anastomosis before closure of the abdomen often show a reduction of 150 to 200 mm. of water. The pressure rarely returns entirely to normal, however, and hence some of the patients have experienced postoperative hemorrhages although the magnitude and frequency of the bleeding episodes were significantly reduced. In almost every instance when ascites was a major problem preoperatively there has been no reaccumulation of fluid after the first 3 months postoperatively.

Whipple, Blakemore and their associates have performed portacaval shunts on some 40 patients, Linton[10] on 15 and the author has carried out shunts on 6 additional patients. The postoperative hospital mortality for the 61 patients has been approximately 20 per cent. We believe with improvement in the selection of cases, emphasis on the end-to-side splenorenal anastomosis and greater operative experience the mortality will be reduced substantially.

The first patient operated upon by the author for intractable ascites employing the Crosby-Cooney procedure modified by the addition of a fasciotomy was a 55-year-old Chinese who had a large painful umbilical hernia and an enormous amount of fluid in his

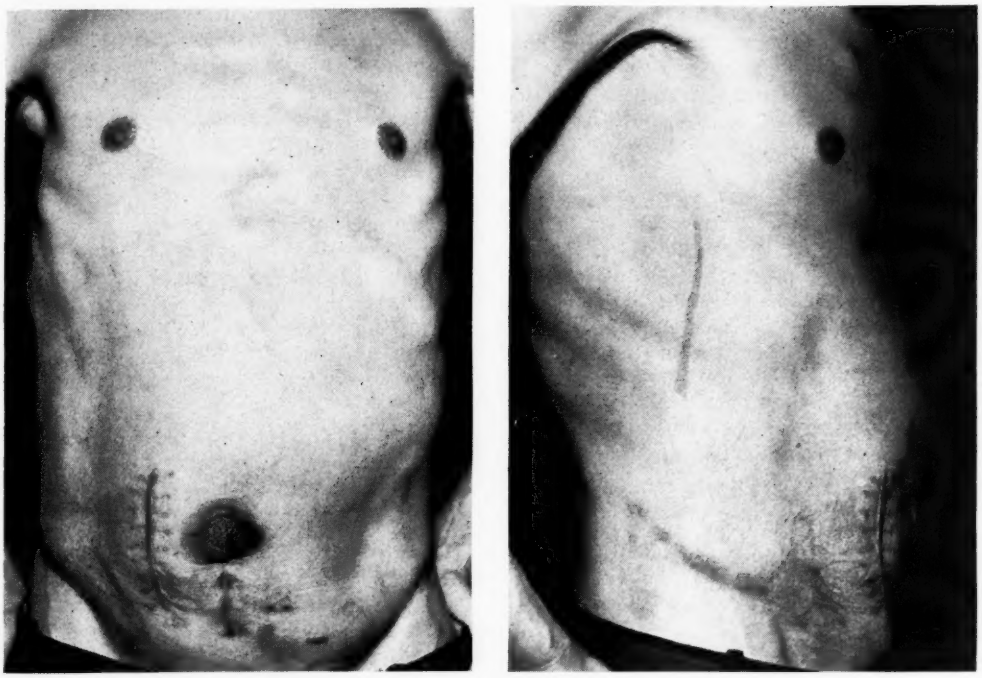

Fig. 5. Anterior and lateral views of patient three and a half months postoperatively. The umbilical hernia is flat and the subcutaneous pocket has disappeared. There is no evidence of ascites.

abdomen. Work-up revealed fairly good liver function and a serum protein level of 6.5 Gm. per cent with an albumin-globulin ratio of 2.8 Gm. and 3.7 Gm. Tis heart was fibrillating and he appeared to be too poor a surgical risk for a portacaval shunt. Table 1 shows the frequency of paracenteses and quantity removed during his hospitalization. Good dietary therapy and digitalization did not influence the rate of formation of ascitic fluid. On March 20, 1947, he was operated upon and by the twenty-eighth postoperative day not only was there no evidence of ascitic fluid but also the fluid in the subcutaneous pocket had absorbed. The patient never showed ankle or scrotal edema during the early postoperative period as had the patients of Crosby and Cooney. Figure 5 A and B show the patient three and a half months postoperatively. At this time the serum proteins were 7.3 Gm. per cent with an albumin-globulin ratio of 4.0 Gm. and 3.3 Gm. The cephalin flocculation test was still 3 plus. The most recent examination some five and a half months postoperatively revealed him to be in excellent health, the umbilical hernia flat, and no evidence of ascites.

TABLE 1. DATES AND VOLUMES OF PARACENTESES.

Date	Volume in cc.
10/5/46	9200
10/11/46	2500
10/26/46	7250
11/20/46	10000
12/5/46	11000
12/16/46	9500
1/18/47	6500
1/29/47	10000
2/4/47	8500
2/14/47	9500
2/26/47	4500
3/7/47	4000

SUMMARY

The experiments of Nicolai Eck, the Russian physiologist, who performed the first anastomosis between the portal vein and the inferior vena cava in animals in 1877, have led to a practical method of management of portal hypertension.

Curiously, successful application which for the first time followed the development of the nonsuture vitallium tube technic has recently returned to the suture method of anastomosis.

Portal hypertension may be due to intrahepatic block of the portal vein or its radicles as exemplified by cirrhosis of the liver or extrahepatic block as in Banti's syndrome.

The two chief clinical manifestations of portal hypertension are gastrointestinal hemorrhage from esophageal varices and intractable ascites.

Portacaval shunts may be performed either by an end-to-side anastomosis of the portal vein to the inferior vena cava or by an end-to-side anastomosis of the splenic vein to the left renal vein after splenectomy. The latter procedure is more highly favored at present.

Splenectomy alone should never be performed for Banti's syndrome without operative analysis of the relation of the coronary vein to the site of extrahepatic portal block. If there is no hypertension in the coronary vein then simple splenectomy will be curative.

In patients with cirrhosis of the liver whose essential problem is intractable ascites and who are not good operative risks generally, the modified Crosby-Cooney operation with fasciotomy should be employed.

In the group of patients discussed in this paper whose outlook is desperately grave, surgical intervention, although accompanied by a significant mortality, has proven to be worth while.

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Resection of the Rectosigmoid Region With Preservation of the Anal Sphincter*

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WHILE surgery for the eradication of carcinoma in various areas and organs of the body has approached standardization, with minor refinements being constantly proposed, the rectosigmoid region remains in a controversial realm, particularly in reference to the preservation of the anal sphincter. Seemingly, time has not lessened the intensity of the debate, the fire and energy of which has produced light of a variable modality. Reduced to simple propositions it amounts to this:

Is it possible to remove adequately the involved segment of the rectosigmoid region without sacrificing the sphincter, and at the same time maintain the same percentage of five-year cures reported by outstanding operators in this field? Can assurance be given that the operation is sound technically and that a functioning sphincter will remain?

It is recorded that in the United States alone there are 160,000 deaths annually from cancer, of which 8 per cent, or 12,800, originate in the rectosigmoid region. (Add to this number the 3,200, or about 25 per cent, who have been cured by appropriate surgery, and we have under discussion the fate of 16,000 persons annually.) It is a matter of common knowledge that among laymen the dread of a colostomy veers many to forms of treatment, or lack of treatment, which dooms them to an untimely death. The reluctance to seek surgery, unfortunately, is not confined to laymen, for many physicians share the same view and paint a Frankenstein picture of a colostomy, through ignorance or failure to make an early diagnosis. While a colostomy is not a thing of beauty, it may be a joy forever. Many intelligent patients pursue gainful occupations, enjoy life, and are never suspected of being the unproud possessors of artificial ani. Nevertheless, between a normal functional sphincter and a colostomy, there can be but one choice. The demand for something better has an esthetic and practical basis.

Carcinoma of the rectosigmoid usually is slow in its growth and is recognized easily by the methods at our disposal. It offers an opportunity for cure because it remains well localized and metastasis is not rapid in most instances. Lesions in this region become inoperable by direct extension to adjacent organs or by metastasis. Liver involvement by way of the portal vein occurs frequently enough, unfortunately, to be a matter of great concern. Occasionally the latter complication occurs before lymphatic nodes are found in the vicinity of the primary lesion; in fact, it may occur before a bowel involvement is even suspected. (Miles,[1] in his Lattsomian lectures in 1926, cited 2 cases in which metastases were found in the liver at necropsy, but the primary growth in the rectum had involved less than half the circumference of the bowel and therefore was considered an early stage. In neither case was there an extramural lymphatic spread; nor was the liver enlarged or the seat of metastases. He writes, "It is fortunate that dissemination by the veins is very rarely encountered so that in practice we can disregard the possibilities of its occurrence." We do not believe the modern pathologist will concur in this last statement.)

The lymphatic system is the avenue which the surgeon seeks to barricade by operation, and it would not be amiss to sketch briefly the lymphatics in the region under consideration. The system consists of fine channels from anus to sigmoid in the submucous, muscular, and subserous coats of the bowel. The flow of lymph is transverse to the long axis of the gut until it reaches the pararectal nodes (the nodes of Gerota), when they gather in distinct channels with small glands at frequent intervals and then follow *upward* the course of the vascular system. The lymphatics are divided into those of the inferior and middle

* Read before the Twelfth National Assembly, United States Chapter, International College of Surgeons, Chicago, Sept. 29–Oct. 4, 1947.

group and a superior group. In the former, the current is upward, without communication with any pelvic organ, joining the trunks of the superior region which drain the upper rectum and sigmoid. The involvement of the lymphatics and the extension is transversely through the submucous, muscular, and subserous lymph channels until it emerges in small collecting lymphatics, converging into larger trunks and nodes with the current always cephalad. This is not a theory, but a demonstrable fact.

Dukes' classification,[2] announced in 1932, has been looked upon as a model and was based on 215 cases of the Miles type of operation. To quote, "A cases are those in which carcinoma is limited to the wall of the rectum, there being no extension into the extrarectal tissues and no metastasis in the lymph nodes; B cases in which the carcinoma has spread by direct continuity to the extrarectal tissues but has not invaded the regional nodes; and C cases in which the metastases are present in the regional lymph nodes. . . . There is no relationship between the surface area of the growth and the depth of penetration." Eight years later Dukes[3] reported an analysis of 1,000 cases of carcinoma of the rectum. He did not define clearly the anatomic or surgical involvement, but it comprised those cases in which the Miles operation was employed. In his earlier report Dukes made no reference whatsoever to metastases by way of the veins, but in 1940 he says, "The extension of rectal cancer by venous channels has received relatively little attention in routine pathological investigations, yet in view of secondary growths in the liver, venous spread is obviously of the first importance. Of course, data as to venous spread obtained in this way have not the same precision as information concerning local spread and lymphatic metastasis. . . . If dissection reveals cancerous deposits within veins, then this is evidence of probable venous dissemination, but the nondiscovery of intravascular growth does not exclude the possibility of venous spread since emboli may already have been carried away in the blood stream, leaving no trace behind. . . . Evidence of extension of rectal cancer within the lumen of hemorrhoidal veins was found in 17.8 per cent of the 539 cases in which the veins were dissected and examined microscopically."

Glover and Waugh[4] of the Mayo Clinic have made an outstanding contribution to the problem of metastasis in carcinoma of the rectosigmoid region. I do not believe any study of the subject in recent years remotely approaches the thoroughness of their work which, incidentally, upsets some accepted theories concerning the secondary invasion by carcinoma in this region. They selected 100 cases in which abdominoperineal resections were done and meticulously examined every specimen in reference to its lymphatic dissemination. In addition, they analyzed the operative reports and case histories. Microscopic sections were made of 1339 nodes. In 20 per cent of the cases carcinoma had invaded the vascular system and confirmed what others had noted; namely, this complication often precedes the nodal involvement. The invasion of the venous vessels is not the result of a growth of long standing or extensive involvement, but it has its origin while the growth is still confined to the bowel. The importance of early diagnosis and treatment becomes self-evident.

In only 1 per cent of the cases were there any involved nodes more than 2 cm. below the visible or palpable border of the growth, except in those cases in which the higher lymph channels were blocked by malignant cells, permitting no additional invasion, but shunted the cells to areas below the growth. In the analysis of more than 239 of the 507 cases in literature in which the removed tissues were examined, these authors found that only 8 cases showed involvement below the growth and only one showed involvement more than 2 cm. below. The authors state, "One case, therefore, that of Gilchrist and David, in which the involved node was 4 cm. below the lesion, represents the total significant retrograde lymphatic flow from carcinoma of the rectum contained to date in the literature. . . . If this obtains so rarely in cases in which the patient is already doomed to early demise, because of the advanced nature of the lesion, one may be justified in making the statement that retrograde lym-

phatic metastasis *never* occurs from growths still in the stage of reasonable operability."

Seefeld and Bargen [5] expressed the opinion that lymph nodes are poor indicators of visceral metastatic lesions which are often present independent of metastatic nodes. Intravascular invasion means as much from a prognostic standpoint as neoplastic nodes, and its absence means much more. In 100 cases of rectal carcinoma, lymph nodes were involved in 30 per cent, veins in 20 per cent, and nerve trunks in 30 per cent. Venous and nodal dissemination occurs more often in the young, while neural invasion is not related to age.

Surgery offers the only hope of cure in carcinoma of the rectosigmoid region, and by its early employment a creditable number of cures are obtained. In our zeal to circumvent metastasis via lymphatics, undue stress has been laid upon the necessity of removing the sphincter, levators, and anus. Investigators have demonstrated beyond any reasonable doubt that less than 1 per cent of the operable cases have a nodal extension more than 2 cm. below the growth and a resection below this level does not increase the risk of recurrence. Curative surgery is concerned in removing the primary growth and all possible metastases, and it follows that removal of the anus and substitution of a colostomy cannot increase the cures more than 1 per cent without taking into consideration the slight additional risk and colostomizing the patient. It is in the light of these facts that we believe a sphincter-saving operation is justified. Perhaps the initial objection is the danger of an open anastomosis. It is about time that we took stock of the time-honored closed anastomosis. A definite trend in that direction has received the support of Allen [6] and other operators, and we should profit by their experience and apply their methods. Dixon [7] has developed a technic for end-to-end anastomosis within the abdomen for carcinoma in the rectosigmoid region which in his hands at least has warranted its more general use. He states, "The risk entailed in the operation is appreciable, but the mortality is lower than that accompanying the combined abdominoperineal operation. Beyond all question the procedure I have described herein is far more acceptable to the patient and probably is as actually effective as the combined procedure, which generally is considered more radical. The type of operation which I carry out has been employed for the eradication of lesions situated in the rectosigmoid, or at, or near, the pelvic peritoneal floor, where obviously any type of exteriorization procedure is impossible."

McNealy and Lands [8] report 34 (consecutive) resections by the open method with but two deaths, neither of which could be attributed to the operation per se. The so-called closed method, they state, has left a diaphragm which has been a source of secondary obstruction. They call attention to the importance of the preoperative preparation in this type of anastomosis and conclude with this statement: "The shortened hospital stay, the elimination of multiple operations, the saving in time, expense, and psychologic trauma together with the low mortality, make the procedure of resection with primary open anastomosis one of choice or at least one to be recommended in resectable nonobstructive carcinoma of the colon."

Concerning the second proposition: Can assurance be given that the operation is technically sound and a functioning sphincter remain? This question can be answered in the affirmative chiefly because chemotherapy has entered the field as the first surgical assistant.

The early attempts to preserve the sphincter seem enveloped in a literary fog, but Hochenegg is credited with the first authenticated technic to master the so-called "pull through" operation. Some, like Kraske, made no attempt to preserve the sphincter, but others made sporadic efforts to do so, with indifferent success. A survey of the contributions of these operators discloses that the anastomoses were leaky and fistulae were common; gangrene and sloughing of the upper segment were both frequent and devastating. The posterior resection alone, with preservation of the sphincter, as suggested by Mahoner,[9] left much to be desired. No opportunity was furnished with this method to determine the full extent of the malignancy, presence

of metastases, or observance of other possible pathologic conditions which could evaluate the operability or the prognosis. In other words, only half the picture, and possibly the less vital part, was presented through the rear approach. Control of hemorrhage and protection of the pelvic contents were obstacles which severely taxed the ability of the operator. The methods of anastomosis in the earlier days lacked the finesse of modern standards, consequently the forbidding mortality reverted the operation to the abdominal or combined method. Recently there has been a revival of the posterior type of operation as noted by Jenkins [10] and D'Allaines and DeVernejoul,[11] but sufficient time has not elapsed to weigh it on a five-year basis. A combination of the abdominal and perineal route without sacrificing the sphincter has much to recommend it, provided the operative mortality and extension of life closely parallels that of the radical operation as practiced by Jones, Lahey, and other supersurgeons. The statement has been made that a three-year life with a competent sphincter is more desirable than a five-year life with a colostomy, but I am not in accord with such sentiments.

Babcock and Bacon probably have contributed more than any other group to advance the surgery of the rectosigmoid and sigmoid with the maintenance of the integrity of the sphincter as the objective. Babcock has not hesitated to modify the operation from time to time and point out the deficiencies of the earlier ones. In all candor it must be said that many other surgeons have not been entirely satisfied with the results of the pull-through operation because it seems impossible to predict, with reasonable accuracy, whether the patient will have normal control, incontinence, or a stricture. The fault may lie with the operator and not the operation. On the other hand, there is rarely any doubt about the behavior of a colostomy.

I wish to submit for consideration an operation for which no originality is claimed. It may have been in the repertoire of Hippocrates, but it is one that is particularly applicable to rectosigmoid lesions from 6 to 15 cm. above the anus. It is possible that it can be used in even higher lesions, as Bacon has made the statement that he has succeeded in pulling the transverse colon through the anus in his type of operation. In this lower area it is next to impossible to exteriorize the growth, and an end-to-end anastomosis is unusually difficult. The method of Dixon is necessary to accomplish it, and few are as adept as he.

The success of the operation depends on the operability, the technical capacity of the surgeon, and especially the preoperative preparation. It is almost needless to state that no resection should be undertaken in the presence of an acute obstruction. The bowel must be deflated, essentially empty, and any fluid contents which may be present must be rendered innocuous. All of this is possible.

PREOPERATIVE PREPARATION

The routine check-up of the patient is a prerequisite that requires no comment, and any deficiencies should be met by appropriate treatment, even if it necessitates postponing the operation. For five days prior to operation the patient is given daily 15 tablets of sulfathalidine, 1.5 Gm. each, in divided doses. (Preferably the patient is hospitalized.) A nonresidue diet is permitted for three days. Two days prior to operation magnesium sulfate is administered night and morning and an enema the day before and the day of the operation. The dose of Epsom salts may be modified to meet the individual need, but copious movements should be attained. Streptomycin in 0.5 Gm. doses should be administered by mouth every six hours on the two days prior to operation. There is no deviation from the administration of sulfathaladine and streptomycin. If catharsis has been excessive, intravenous fluids are indicated. Only liquid diet is permitted in the last 24 hours.

Spinal anesthesia with sodium pentothal intravenously is my anesthetic of choice. Curare (Intocostrin) is used occasionally but not routinely during the operation.

OPERATION

With the patient in the Trendelenberg position, a generous incision is made in the

lower midline, usually extending above the umbilicus. After the abdomen is thoroughly explored and the condition considered operable, the peritoneum is freed laterally from the rectosigmoid and upward on the sigmoid to permit free mobilization of the area to be resected and displaced. The superior hemorrhoidal vessels are divided between two ligatures, and the peritoneum at the junction with the bladder (a male patient, we assume) is attached. The operation is advanced by completely liberating the bowel from its pelvic attachments, including as much adipose tissue as possible and tying the smaller hemorrhoidal vessels as they are approached. A common error is the failure to mobilize the bowel down to the tip of the coccyx and severing the levator stalks on either side. The failure to do so only adds to the task in the second phase of the operation. In loosening up the bowel an opportunity is presented to estimate the extent of involvement and the amount of bowel to be resected. This is acquired only by experienec. I pass a silk suture as a marker through the outer wall of the gut where I expect to make the high transection, noting that the circulation is unimpaired above that point. The bowel is replaced in the pelvis and a new peritoneal floor is made from the lateral peritoneum and bladder reflection, closing it neatly about the sigmoid. The abdominal wound is closed without drainage, using steel wire or tantalum filament in the fascia and skin. The patient is then turned over, the table flexed and the patient assumes a semijackknife position. The buttocks are the most elevated parts and can be held apart by adhesive to give better exposure for the next operative field.

An incision is made from the middle of the sacrum to the perianal margin in the midline. This is deepened. The coccyx and the fifth and fourth sacral segments are removed with a bone cutting forceps. The sacral vessels lie close to the anterior surface of the bone and are ligated and divided at this time. The presacral fascia is then divided in the midline, the wound well retracted and entrance into the pelvic cavity follows. The mobilized bowel is easily secured and delivered through the wound with the identifying suture marking the line of proposed division of the bowel. At the two places where the bowel will be transected they should be prepared for anastomosis by removing tags of fat and epiploica until clean surfaces are obtained. The lower point will be 6 cm. or less from the anus, and the upper point 15 cm. or more, depending on the judgment of the operator and to what extent the bowel has been mobilized. The bowel is divided between Stone clamps, which are then removed and the open ends of the bowel approximated; if the abdominal part of the operation has been properly executed, the approximation is without tension. A guy suture on each side retains the bowel in a position for an open anastomosis, and any accepted method can be used. I prefer fine chromic catgut on eyeless needles, curved or straight. The first or posterior row, in the present position of the patient, is of the Lembert type and joins the serous surfaces together for half the circumference. The next row, immediately superior to the first row, is through all coats of both bowels and is of the locking type. These two rows complete half the anastomosis, the posterior half, as the patient lies on the table, but in reality is the anterior half when he assumes a recumbent position. At this point a soft rectal tube is passed through the anus a few centimeters beyond the incomplete anastomosis and anchored by a silk suture through the skin in the perianal region. I believe this is preferable to passing the tube after the anastomosis is completed, as its visible introduction is an insurance against injury. I am not convinced that a rectal tube is necessary and may abandon its use. The third row of sutures is of the Connell type through all coats of the bowel and the fourth is of the Lembert type, and this completes the anastomosis. The guy sutures are removed, the bowel replaced in the pelvis, and the wound is closed. Tantalum filament is used in the skin and a small cigarette or Penrose drain is placed in the lower end of the wound.

Postoperatively the Wangensteen tube is a routine must for two or three days, during which time the patient is allowed water and some clear fluids in satisfying amounts. Fluids are administered parenterally to the extent

of 3,000 to 4,000 cc. daily and consist of glucose in saline or distilled water and protein hydrolysate. The intravenous solutions are gradually reduced in quantity as the gastric absorption becomes evident. For the relief of pain I prefer demerol or dolophine but have found occasional supplemental doses of morphine most welcome by the patient. Blood and plasma are used only as indicated; the same holds for vitamins, although I am somewhat hazy on the indications for the latter.

I believe in early mobilization and early ambulation. By mobilization, if the word can be used in this sense, I mean that the patient should move his arms and legs freely and turn frequently in bed with or without assistance. The patient is propped up in bed on the second and third days. On the fourth and fifth days he sits on the side of the bed and exercises his legs, and on the sixth day he is up in a comfortable chair. Mineral oil is given on the fourth and fifth day and, if ineffectual, is replaced by castor oil combined with paregoric, and occasionally prostigmine is given at six-hour intervals on the sixth and seventh days. An enema is not used before the eighth day, and rather than delegate its administration to some disinterested person, I am inclined to dispense altogether with enemas.

Outside the technic of the operation, nothing is so important as the preparation, which may be altered, but never slighted. It is my firm belief that the open anastomosis carries a negligible risk if chemotherapy is vigorously used. If infection can be eliminated, the mortality can be kept remarkably low, and that this is possible has been amply proved. Poth [12] found that after the sufficient use of sulfasuxidine for 42 days a third of the diameter of the bowel could be divided and dropped back into the abdomen without suturing, and 80 per cent of the animals would survive. He stated further, "Evidence accumulative over the past five years indicates that sulfasuxidine and sulfathalidine when properly administered are bactereostatic agents which will sufficiently modify the bacterial flora of the bowel contents, allow a satisfactory preoperative mechanical preparation of the colon, favor early healing of the colon at the line of suture and reduce the incidence of postoperative peritonitis and wound infection."

Romanski [13] states that the administration by mouth of 0.5 Gm. of streptomycin four times daily on two successive days will act as an efficient bacteriostatic. Penicillin does not accelerate the action of sulfathalidine or sulfasuxidine, but on the contrary, is antagonistic to some extent. We have not used it preoperatively, nor do we believe it is necessary postoperatively, without specific indications, although its prophylactic use may be endorsed. We have every reason to believe that antibiotics have given so much to intestinal surgery that we are entering an era in which some of our former practices will be profoundly altered, one of which will be the substitution of the open for the closed anastomosis.

CONCLUSIONS

There is abundant pathologic evidence that primary lymphatic metastasis extends less than 2 cm. below the malignancy of the rectosigmoid in less than 1 per cent of the cases. Resection more than 2 cm. below the growth permits preservation of a functioning anal sphincter. A combined abdominococcosacral operation permits a complete survey of the abdomen, radical resection, hemostasis, and negligible risk of infection. The posterior open anastomosis presents no unusual technical difficulty and with rational preoperative employment of sulfathalidine and streptomycin, is a safe procedure.

The immediate mortality is not higher than that of other radical operations for the same disease, but the convalescent period is curtailed; a colostomy is eliminated and a functioning sphincter remains. Whether five-year cures will compare favorably with other types of rectosigmoid resections is an open question which could be best answered by the College * setting up a registry for this disease.

The basis for my opinions concerning rectosigmoid carcinoma at present rests on data from the larger clinics and centers, which of necessity is not a true cross-section of the

* The International College of Surgeons.

immediate or remote mortality. A very large number of cases, probably the majority, are not reported. If such a registry were organized and members of the College reported their cases with all essential details, in the matter of six or seven years we would have accumulated invaluable records upon which surgery could advance with that directness and crystal clearness which is a requisite of superlative surgery, with less than which we should not be content.

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Aseptic Necrosis of Bone Following Trauma*†

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DEATH of bone will result from any condition which interrupts the blood supply to a segment of bone so completely that minimal oxidation and nutrition of the bone cells cannot be maintained. Death of the head of the femur has resulted from fracture of the intracapsular femoral neck or dislocation of the hip.[1] Aseptic necrosis of small bones, such as the tarsal or carpal scaphoid, or semilunar bones, and of epiphyses at the distal end of the metatarsal bones have been described.[2] These are the more commonly recognized locations for aseptic necrosis of bone following trauma. Death of the body of the astragalus following fracture or fracture dislocation, and death of large fragments in segmental fractures of the long bones has been described by Phemister,[1,3] but the clinical significance of traumatic devitalization of bone has not been recognized by all fracture and orthopedic surgeons.

Johnson[4] has studied the blood supply to the larger long bones. He found that the diaphyses of the bones are nourished by (1) the nutrient artery which penetrates the cortex in the middle third of the shaft, and branches to extend toward both ends of the bone; (2) the metaphyseal vessels, a branching network of small arterioles which penetrate the cancellous bone near the ends of the shaft and extend into the medullary tissue; and (3) the periosteal blood supply which nourishes the outer half of the cortex and is least important of the three.

A large fragment in a comminuted fracture of the femur, tibia, humerus or one of the bones of the forearm may be so detached from surrounding soft tissue that nutrient, metaphyseal and periosteal blood vessels supplying the fragment are detached from it. In such cases, the segmental fragment and sometimes the ends of the two major fragments are so devitalized that they are in the same situation as a full thickness, autogenous bone graft (Fig. 1). Axhausen[5] showed that periosteum and at least some endosteum of bone transplants survive and take active part in generating new bone. As is true of the bone graft, most of the bone cells of a large fracture fragment die. Active hyperemia of adjacent bone and soft tissue follows the injury. Some peripheral bone cells survive. Other adjacent bone tissues become active. A vascular fibrous stroma invades the necrotic bone and aids in absorption. There are large phagocytic cells which resorb dead marrow. The resorption by invasion of phagocytes and fibrous tissue is followed by bone formation. Both processes are going on at the same time. This transformation is very slow and may require years until new bone with haversian canals and medullary red bone marrow has replaced the old necrotic bone and the intervening callus (Fig. 2)

Phemister[1,3] has most accurately described this method of bone absorption and replacement, and has called it "creeping substitution." In all instances of aseptic necrosis, union of the fracture will be delayed and complete healing with recanalization must await replacement of devitalized bone by creeping substitution.

Phemister[1] in 1930 discussed aseptic necrosis following interference with blood supply in fractures of the head of the femur, the body of the astragalus, the os calcis, and in bone transplants. Cornil and Coudray[6] reported as early as 1904 that in experimental fractures there is necrosis of the cortex for a variable distance from the fragment ends. This zone of necrosis is replaced slowly by bone growing in from the living cortex with which it is continuous, and to some extent from the adjacent callus. The process of healing of a fracture takes place simultaneously with the transformation by creeping substitution of the necrotic bone to new living bone. Leriche and Policard[7] were of the opinion that the calcium used in the formation of callus came for the most part from the aseptic necrotic bone at the ends of the fracture fragments.

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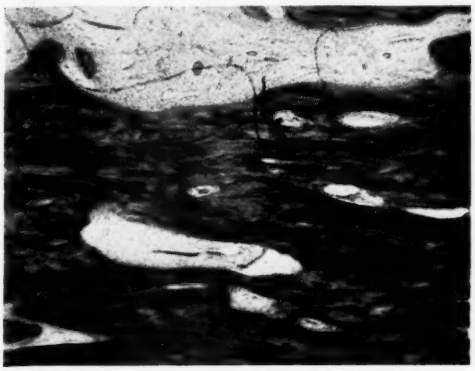

Fig. 1. Photomicrograph of a microscopic section of the end of a full thickness tibial bone graft obtained six months after transplant for fracture of the humerus. The bone cells have disappeared together with their nuclei, indicating death of the graft. X176.

Fig. 2. Photomicrograph of bone obtained from the ends of fracture fragments six months after injury, which resulted in nonunion. The dead bone shown in this section is undergoing absorption and replacement by creeping substitution. X156.

The bone which is necrotic retains a density which is greater than that of the living adjacent bone, and is so recognized in roentgenograms that are made after sufficient time has elapsed to permit atrophy of the bone which has retained a good blood supply. This relative difference in density is produced by the fact that the living bone atrophies following the fracture while the bone which is deprived of its vascularity is unable to atrophy, having no blood supply to take away the opaque mineral salts.

The following case reports demonstrate the typical course of a segmental fracture of a major long bone.

Case 1. M.G., male, aged 43 years, was struck by a passing car while he was changing a tire on April 2, 1946. He was admitted to my service 11 days after the injury. Roentgenograms at that time revealed a comminuted segmental fracture of the upper end of the tibia and a fracture of the fibula. A larger anterior fragment which was separate from the proximal and distal fragments, measured approximately 6 inches in length, and was more than half of the thickness of the shaft of the tibia. The fracture was reduced by open reduction and care was exercised to avoid stripping from any of the major fragments more periosteum than was absolutely necessary in order to obtain accurate position and secure fixation. Roentgenograms which were made 8 months after injury, December 7, 1946, revealed healing of the fracture but the fracture lines have not yet been obliterated, and the major fragments still retain greater density than does the surrounding bone (Fig. 3).

Although this fracture occurred in bone which is largely cancellous and which might reasonably be expected to heal within a few weeks, the actual union was delayed for months because of the disruption of blood vessels to the fragments.

Case 2. J.H., male, aged 40 years, suffered a fracture of the middle third of the right femur on May 31, 1946, when a large slab of concrete fell, striking him on the right thigh. A massive medial fragment of the femur was completely displaced from contact with the proximal and distal portions of the femoral shaft. Although this was replaced at operation without detaching the soft parts, it failed to undergo atrophy, but retained the density which we recognize in the roentgenograms as that of aseptic necrotic bone. This delayed but did not prevent union. Roentgenograms show that satisfactory union for weight bearing has taken place, although a long central zone of the fracture line has not yet bridged across with bone. The major fracture fragment and a portion of the distal end of the proximal femoral shaft fragment retain their density after 10 months (Fig. 4).

Seven months after this injury the patient developed an area of localized swelling in the region of the fracture. On two different occasions this was incised and a considerable amount of serum and necrotic material was expressed. There has been another flare-up of cellulitis since removing the plate. This soft tissue necrosis and abscess formation occurred 7 months after the wound had healed following open reduction. The massive bone necrosis which is still undergoing creeping

Fig. 3. Case 1, M.G. Aseptic necrosis of varying amounts of bone including a large detached fragment in a comminuted fracture of the proximal third of the tibia, eight months after injury. Fractures are uniting but the fracture fragments still retain greater density than is present in adjacent bones, indicating a deficiency of blood supply and explaining the delay in union after accurate fixation of the fragments.

substitution and revascularization may have produced the soft tissue reaction.

Case 3. J.L., aged 53 years, suffered a severe crushing injury to both legs December 5, 1946. The fracture in the right leg was segmental, with a large, full-thickness fragment of tibia which included part of the proximal and most of the middle third of the shaft. This was accurately reduced and internal fixation secured with metal plates and screws. Eight months later, on July 24, 1947, there was very little evidence of union. The large segmental central fragment which had never been completely detached from the soft tissue about it was found to have retained almost the same density which was present on the day of the accident (Fig. 5).

A more comminuted fracture with smaller fragments was sustained in the upper third of the left tibia. These fragments were adjusted for position and fixation was obtained with a metal plate. Eight months after the injuries, the fractures in

Fig. 4. Case 2, J.H. Roentgenogram made April 9, 1947, approximately 10 months after the fracture. Although the large medial fragment still retains much greater density than the adjacent bone, there has been replacement by creeping substitution along the periphery with union of the fracture. Many additional months will be required for complete transformation and vascularization of the bones in this location.

this leg were united (Fig. 6). These fracture fragments had approximately the same density as that of the tibia below the level of fracture. Either because these fragments were small and in contact with vascular soft tissue about them or they had retained enough blood supply by way of nutrient or periosteal blood vessels, they had undergone rapid transformation by creeping substitution to new bone of relatively normal density.

COMMENT

The larger the separate fragment in a segmental fracture in a long bone, the poorer the

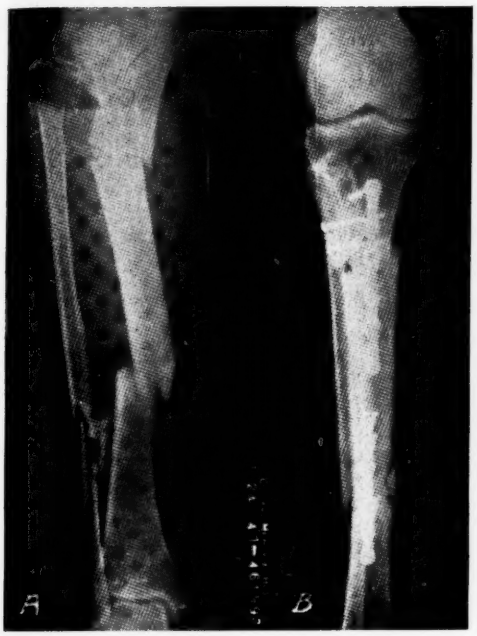

Fig. 5. Case 3, J.L., right tibia. This roentgenogram of the right tibia reveals the extent of the injury to the bones at the time the patient was first admitted to the hospital (A), and the healing that had taken place eight months later (B). The density of the large full thickness segmental fragment in comparison with the bone adjacent to it indicates aseptic necrosis with very little transformation. The fracture is beginning to heal but there is not yet sufficient union to permit weight bearing. Many more months will have to elapse before all of this fragment can be transformed by creeping substitution into living bone tissue.

Fig. 6. Case 3, J.L., left tibia. (A) This is also a segmental fracture but the fragments are split up and are not nearly so large as those in the right tibia (Fig. 3). Such fragments have a much better chance of survival, as they require less soft tissue and vascular attachments to maintain enough circulation to preserve viability.

(B) This roentgenogram was made approximately eight months after the injury. Solid bone union has taken place with the exception of one lateral fragment which is uniting, though at a much slower rate. The density of the united fragments is approximately the same as that of the shaft distal to them, indicating that they have had an adequate blood supply or have already been completely transformed by creeeping substitution.

prognosis from the standpoint of viability of that fragment. In the event that a fragment is partially devitalized and does not retain enough intact blood vessels to maintain a reasonable exchange of arterial and venous blood, aseptic necrosis will occur. Union will then be delayed for many months. With good fixation, however, union will take place long before the large fragment has undergone complete replacement by creeping substitution.

SOMMAIRE

Dans le fracture segmentale d'un des os longs, plus long est le fragment separé, plus mauvais est le pronostic de sa viabilité. Dans les cas où le fragment est absolument dévitalisé et ne renferme pas assez de vaisseaux intacts permettant un échange raisonnable de sang artériel et de sang veineux, la nécrose aseptique survient. L'union est retardée pour plusieurs mois. Mais avec une bonne fixation, l'union s'effectue avant que le grand fragment ait été complétement remplacé par substitution rampante.

SUMARIO

En las fracturas segmentadas de los huesos largos. El tamano del fragmento segmentado determina el prognosis de su viabilidad. En general contra mas grande es el fragmento menos es su viabilidad. Cuando el fragmento esta parcialmente devitalizado por razon de

que su circulacion arterial y venosa ha sido comprometida la necrosis aseptica es el resultado. En estos casos la union se retardara por muchos meses. Sin embargo la buena fixacion favorecera la union y esta se obtiene mucho antes de quel fragmento segmentado haya sido reemplazado.

RIASSUNTO

Nelle fratture segmentarie delle ossa lunghe la prognosi diventa tanto piu' riservata, quanto piu' esteso il frammento che viene superato. Una necrosi asettica si stabilisce infatti allorquando il frammento e' parzialmente devitalizzato e non conserva una vascolarizzazione sufficiente per mantenere un adequato scambio di sangue venoso ed arterioso. In questi casi l'unione dei frammenti puo' essere ritardata per parecchi mesi. Con una buona fissazione l'unione si stabilisce invece molto prima che il frammento piu' voluminoso sia completamente degenerato.

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Ten Years of Plastic Surgery in a Penal Institution: Preliminary Report

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HISTORICAL

THE application of the resources of plastic surgery to criminology is an interesting departure from the conventional perspective of surgery.

The application of medical thought in American criminology dates from the year 1821, when the state of Massachusetts appointed a physician to its penitentiary ostensibly for purposes of sanitation. Prior to that time the presence of a physician in a penal institution was not tolerated. A psychiatrist was not officially assigned to a prison until 1905 when the same state appointed Dr. Guy Fernard as physician to the State Reformatory. Yet, to contemplate the application of plastic surgery to inmates of a state penitentiary, even as late as 1937, seemed a strange deviation from common practice.

In that year Dr. Frank Chmelik, Chief Physician to the Illinois State Penitentiary, brought to me the problem of correcting the bodily defects of the inmates of that institution. It was his observation that such defects set the inmate apart from others not only in appearance and usefulness, but in gaining social contact through recreational activities on a par with his fellows.

APPEARANCE AND BEHAVIOR

Personal appearance, in this macabre age of the Machine, Mammon, and Materialism, is pretty generally recognized as an important factor in the gaining of opportunity and the realization of happiness. Contrariwise, defects and deformities of the human body lead to unhappiness and feelings of frustration and inferiority. According to Adler, such feelings actually have their basis in inferior groups. If these organs happen to be exposed to full view and thus make it impossible for the individual to compete with his fellow men on an equal footing, it is not rare for him to become asocial, if not actually antisocial. The association of crime and bodily deformity is not unknown. Examples are legion.

Eligius Weir, O.F.M., for over 20 years the Catholic Chaplain at the Illinois State Penitentiaries, referring in his book "Criminology" to the correction of physical diseases in criminals, avers that "When physical afflictions have been corrected in antisocial cases, the good effects on conduct have been most astounding." He cites one of our inmates at the Illinois State Penitentiary as an example: "There is the case of an individual who has twice come to prison for embezzlement from employers. He is a very intelligent person and a capable office-worker. However, his bodily and facial configurations are such that his personal appearance is not prepossessing and all his life he has been made to feel unwanted. Because he felt lonely and wished to attract people to him—and knowing the drawing power of a good spender—he committed his crimes so that he might have funds to be that kind of a person. Much of the money obtained from his defalcations was spent for lavish entertainment but he also spent a substantial sum in an attempt to improve his appearance by plastic surgery."

In this connection I have a personal communication from Dr. Ferris Smith of Michigan who recently operated on the well-known case of a 16-year-old Chicago boy, who threatened the abduction of his employer's children unless a high ransom was paid him. When arrested by federal agents, he bluntly admitted he wanted the money to have his congenitally deformed face altered because all his life he was called "monkey face," and excluded by others.

After describing the boy's facial appearance, Dr. Smith goes on to say, "He was naturally depressed and sour on the world in general." Following the operation, the doctor adds, "He is now a very likeable and happy individual who is keen about his future." And, Dr. Smith concludes, "He is an ideal example of the individual who gets out of touch with Society and may do some criminal

thing because of a physical deformity which admits of correction. I am very pleased to have contributed this to his apparently happy future.''

CAUSES OF CRIME

The positive causes for crime as laid down by different authors vary not only in word and concept, but in actual premise. They may all, nevertheless, be reduced to three basic theses and that is that crime is essentially hereditary, environmental, or organic.

The organic theory implicates medical consideration. As a matter of fact research and experience over the past 40 years seem to indicate that all three concepts are involved in some degree.

This allows the problem of criminology to be reduced to an interesting hypothetical chain of causal factors which begin with the birth of a biologically fragile quantity, the human being, in whom the mother initiates certain habits and the father heavily influences behavior. The so conditioned child, particularly if beset with a physical defect, then comes into revealing conflict with his associates and environment. This sets up stresses to which the child must adjust to survive. At every turn he must choose between family precepts, the world and self. No matter the choice, it all requires a psychosomatic threshold whose absence may make any choice seem ultimately the wrong one. Notwithstanding, the conditioned mind and irreversible somatic habitus become objects of lifetime appraisal by others and subjects of true concern to the bearer. The appraisal of society is variable and problematical, but the psychologic trauma remains inescapable.

The item of greatest import to the plastic surgeon, in this manifold causative order of things, is the relationship of physical deviations and appearance to behavior and finally crime.

PATHOGNOMIA CRIMINALIS

In passing we must take note of the frequently quoted hypothesis of the criminal anthropologic type, which was popularized by Cesare Lombroso, the Italian criminologist. He contended that certain physical deviations from the norm, such as Darwin's tubercle, were pathognomonic of the criminal type. If this were true, ablation of such deviations by plastic surgery would not aid in the treatment of criminality, but merely suppress identity.

Some disciples of Lombroso even venture that the criminal type can be recognized by certain arrangements of the palmar creases. I have seen this demonstrated in one case, where the prediction came true and the individual was later electrocuted for murder. One case of course proves nothing.

Apropos of Lombroso's anthropologic stigmata of criminality, Dr. Bunta of Chicago, formerly of Loyola University, identifies the criminal as an ''atypical genius'' in company with the '' 'mute, inglorious Miltons'; the muddle-heads; the prodigies and idiot savants.'' The primary difference between true genius and the criminal type, he avers, rests on altruistic creative grounds in the former as against selfish considerations in the latter.

From my experience, the subject of somatic criminal stigmata may be rested with the statement that thus far there is no reliable scientific evidence that a distinct ''criminal type'' is identifiable by specific signs or symptoms. The implications of blind acceptance of such a hypothesis would not only have strange effects upon our moral concepts of good and bad, but also upon treatment of crime.

TREATMENT OF CRIME

The history of the treatment of crime has had its innings, from the exclusive age of cure by punishment, to psychiatric analysis which has thus far yielded a mass of interesting statistics. This led to the modern era of the individual treatment of the criminal based upon the realization that the criminal remains an individual who is in some way a handicapped person.

A physical handicap in a young person who in other ways finds it a struggle to understand the social scheme of things may prove to be the trigger of a psychosomatic conflict which in one individual may lead to a gastric ulcer and in another to crime.

THE PROJECT

With the enthusiastic cooperation of the then and now Chief Warden of the State

Penitentiary, the Honorable Joseph E. Ragen, plus the fine surgical facilities available at the institution, several cases of particular interest formed the seed of a work begun a decade ago and which is still in progress.

The project began in 1937 at the so-called old State Penitentiary in Joliet, Illinois, around a nucleus consisting of six patients. All of these cases had repeatedly been in trouble with the law and remained "problem children" in the penitentiary. The first was a young man born with ears pinned on to his head by nature in what appeared to be an upsidedown position. The second was an inmate who early in life suffered a gross deformity of the foot with loss of a heel, in consequence of which he limped badly and found it difficult to hold any job. The third was one who seemingly got along well until he had lost his nose. The fourth was an individual born with webbed hands and feet. The fifth was an inmate covered from head to foot with hundreds of painful tumors of the neurolipoma type. And the sixth, though conscious of a peculiar looking face, claimed he never had any urge to commit a crime until one day his young son, seven years of age, began to shy away and remark, "Daddy, you look just like a bad man, why don't you change your face."

With the passing of time, all types of male criminals, men of all ages from all walks of life and particularly those where the sociologist, chief physician, psychiatrist, chaplain, or the warden, felt that there was reason to believe some connection may exist between the bodily defect and the individual's behavior, were accepted for surgery. In due course of time, a surprising number of requests were being received, and still are, from family and friends of the inmates for the correction of their physical aberrations, with the affirmation that it will help the individual to face society with greater equanimity.

ACCEPTANCE PROCEDURE

Applications for corrective surgery are made through the Chief Physician, Sociologist, Psychiatrist or the Warden. The individual is then admitted to "sick line" for examination. If he looks like a potential candidate, he is referred to the plastic surgeon and listed for evaluation. If acceptable, he is admitted to the hospital for general checkup and indicated laboratory work including x-rays and photographs of the defect by the Bureau of Identification. Upon admission for plastic surgery he is given preoperative care in accordance with recognized surgical practice. Only acceptable surgical procedures are employed. Technical aid in the operating room is furnished by excellently trained inmate personnel. The patient remains in the hospital after operation as long as necessary for adequate postoperative care. Complete permanent records are kept of the entire process and the surgical procedures employed. With the conclusion of the surgical treatment, the inmate is rephotographed by the Bureau of Identification in charge of Mr. Frank Petty.

An interesting sidelight in this work has been the remodelling of gross or vulgar features in a small group of men labeled as probably confirmed antisocials. They are men in whom the doing of wrong seems to have become a habit or second nature as it were. Many of these have left the prison and have been doing well, but a few are in doubt. They are individuals who since their improvement in appearance have given up ordinary forms of crime such as thievery and risen to higher and more subtle antisocial efforts. They are few indeed.

REASONS WHY INMATES SEEK SURGERY

Although the majority of requests for surgery come from inmates afflicted with obvious congenital or acquired defects, 15 per cent are for purely cosmetic reasons according to our present objective premises as to what constitutes a defect. These include hump-noses, duckbill noses, unusually prominent noses, lop ears, pockmarks, prominent lips, etc.

The reasons usually given for seeking surgical corrections are:

1. The desire for improvement of function.
2. To get rid of a congenital defect which has been a life-long embarrassment.
3. To correct acquired defects so as to better accomplish prison responsibilities.
4. Because this is the first chance the individual has had to look like other people.

5. To be eligible for a better job in the prison.

6. To be more presentable on release.

When the above reasons are compared with the nature of the complaint, this gives interesting insight into personality types of importance to the psychiatrist and the sociologist.

TYPES OF DEFECTS

The defects and deformities encountered between the years 1937 and 1947 among 14,467 admissions are listed in the accompanying table.

Location	Congenital	Acquired	No. of Operations
Ears	27	19	73
Eyelids	3	9	14
Nose	49	109	207
Face	4	34	43
Mouth, lips, etc.	5	14	21
Neck	4	11	16
Jaws, palate, etc	6	4	14
Chest, breasts	2	3	7
Abdomen (minus hernias)	1	2	3
Genitalia	3	2	7
Skin (minus common tumors)	11	189	202
Upper extremity	7	12	27
Lower extremity	9	17	29
Total defects	131	425	663
Grand total		556	
Number of patients		376	

RESULTS OF PROJECT

The *surgical results* of the project have been in every way as forthcoming and adequate as one would expect in any modern hospital. This has been due primarily to four reasons:

The training, zeal and devotion of the inmate operating room and hospital help.

The operating room and hospital facilities.

The cooperaton of the resident staff and sociologist, and

The high discipline and morale of the patients.

There have been no fatalities or deaths on the plastic service in the 10-year period.

There have been no major complications, which is a credit to the inmate nursing staff.

The *psychologic results* have been the most outstanding feature and gain, particularly as concerns improvement in general behavior of the inmates long after operation. Also in the salutary influence this new interest has had on the other inmates in the institution. Finally, there has been a gratifying response from the families of the patients which completes a circle of factors, all having a bearing on the behavior of the individual during incarceration.

The *sociologic results* cannot for the present be stated in full except to say that only 1.07 per cent of the 376 patients operated upon have been returned to the institution in 10 years. This is markedly below the usual percentage. The ultimate sociologic evaluation of the project must await certain official statistics and developments in the future.

ATTITUDE OF THE INMATES TOWARD THE PROJECT

The general attitude of the inmates toward this project can best be expressed by stating that the standing list of applicants for correction of bodily deformities at no time in the 10-year period numbered less than 50 and at the present time constantly numbers well over 100. It can be further expressed in the words of one of the operating room aids who one day remarked, "Doctor, if you should ever stop doing this work for the boys, there will be a lot of heartbroken kids in this big house." In general, the plea is that this is the first and only opportunity the inmate has had for correction of his deformity, because, "The family did not know what to do or did not care," or that "no one was interested anywhere." The most zealous individuals are those who are about to leave the institution and "would like to get rid of all reminders of their former life," particularly when afflicted with scarred faces and what is known as "a tough looking mug."

OFFICIAL ATTITUDES

An inspiring commentary was that of Father Weir, the former Catholic Chaplain

of the Illinois State Penitentiary, who in referring to this project in his book, "Criminology," published in 1941 by the Institute for the Scientific Study of Crime (publication allowed by Cardinal Stritch of Chicago) concludes by saying, "Recently the resident psychologist of a large penitentiary, basing his plea on the psychological significance of physical handicaps to crime, convinced the prison administration and medical staff that it might be a worthwhile experiment to allow a plastic surgeon to make over the configurations of some of the institution's most offensive appearing prisoners. The experiment has been partially carried out: a few ugly faces have been remodeled, blemishes covered, etc. In addition, prison surgeons have straightened a few legs and arms and removed unsightly growths. Today there is something new about the men treated which is not physical; a new light in the eye, a new step, shoulder a little squarer, and head held a little higher. The value of the experiment will be known only after a study of their social readjustment following release." Possibly the best commentary is that of the Chief Warden, Joseph E. Ragen, an outstanding penologist, "This work has done amazing things for our men in their behavior during incarceration and I wouldn't be at all surprised if it helped them a great deal on the outside."

CONCLUSIONS

The following conclusions seem warranted after a 10-year period of plastice surgery on inmates of a state penal institution:

1. A physical defect or deformity, though usually only a contributing factor, can be a dominant cause of crime.

2. The correction of bodily defects in adult inmates of a penal institution strikingly influences their conduct during incarceration. This is in accord with the principles of modern mental hygiene.

3. The removal of such defects makes the individual more confident of his reentry into society.

4. The physical rehabilitation of an inmate not only establishes a psychologic benefit to his person, but has a salutary influence upon his associates and his family.

5. Where criminality has become an established habit, in all other ways resistant to rehabilitation, improvement in the appearance of an adult incorrigible may change the standards of his criminal practices upon release from that of a common thief to that of a specialist of a higher order. It is therefore felt that where bodily defects or gross features, exist in the youthful delinquent, who all his young life is referred to as "monkey face," "one-eared Dago," "fish face," "dog ears," or "limpy," such defects be corrected and their trigger value removed before the boy delinquent becomes the man criminal.

SUMMARY

The origin, nature and plan of the application of the resources of plastic surgery to criminology have been outlined. The work accomplished at the Illinois State Penitentiary on 376 men, numbering 663 operations between the years 1937 and 1947 have been noted. Certain preliminary conclusions have been drawn to the effect that: (1) Although physical aberrations usually are only a contributing factor to crime, in certain cases they may be the dominant cause; (2) the physical rehabilitation of an inmate not only establishes a psychologic benefit to his person, but has a salutary influence with his associates and his family; (3) where bodily defects or gross features exist in the youthful delinquent, who all his young life is referred to as "monkey face," "one-eared Dago," "fish face," "dog ears" or "limpy," it is advisable that such defects be corrected and their trigger value removed before the boy delinquent becomes the man criminal.

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Case Reports

Appendiculocolic Granuloma*

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THE commonly observed course of appendiceal abscess, conservatively treated, is that of spontaneous subsidence. Use of the sulfonamides and penicillin, singly or together, causes a smoother clinical course, less pain, toxemia and disability, but does not seem to shorten the time required for the swelling to subside, even though decrease in the number of abscesses requiring surgical drainage is remarkable. Nor, in the writer's experience, is there shortening of the interval before appendectomy can be carried out without hindrance from the residua of adhesive disease. After three months, however, the appendix is often found free, and the entire inflammatory mass resorbed. Persistence of a palpable mass, and of gastrointestinal symptoms for longer than six weeks after the onset of the acute disease usually indicates the occurrence of such a complication as persistence of a fistula between appendix and cecum or ascending colon.

In a previously reported case,† acute appendicitis apparently preceded the finding of the fistula by 14 years. There was a bizarre x-ray appearance of the cecum, not well understood until the dissection at operation, undertaken for a supposed malignancy of the cecum. The case which is the subject of this report is similar in some respects, although the interval between the acute appendicitis and exploratory operation was much shorter.

Case 1. W.B.W., a 42-year-old engineer, was first seen October 18, 1947, complaining of fatigue, loss of weight, chills, fever, drenching sweats, and more or less constant right-sided soreness, all noted since September 15th. He gave the following history. At the age of 25 he had had x-ray evidence of duodenal ulcer, along with "pain-food-relief" type of distress, following which he had remained careful of his diet, but actually observing an ulcer diet only when the distress became severe. In July, 1946, when he had not had any powders nor watched his diet for a year, he had an attack of right upper quadrant pain, referred in back to the angle of his right scapula, selective dyspepsia, and soreness beneath the right costal margin. Following the report of a positive Graham-Cole test, his gall-bladder was removed in April, 1947. The gall-bladder was found to be thickened, showed evidences of chronic inflammation, but no stones were found. He had never been jaundiced. He made an uneventful recovery and felt well until the first of June when he awoke with mild abdominal cramps, shortly followed by severe right-sided pain. This was situated much lower than that which he had had previously, and was severe enough to prevent his getting out of bed without assistance. He was nauseated, did not vomit, but had severe rectal tenesmus.

The pain continued for two weeks, during which he remained in bed, taking sulfanilamide. He had no appetite, and lost 10 pounds in weight. Still feeling weak and tired, and with moderate anorexia, he had a gastrointestinal x-ray series made on June 20. No mass was felt in his abdomen, and no tenderness elicited during the examination. Moderate pylorospasm, poor filling of the duodenal bulb, and slight displacement medially of the ascending colon (Fig. 1) were reported. His urine was stated to be normal at that time; the red cell count was 5,300,000; hemoglobin, 15 Gm., white cell count 9,050 with 81 per cent neutrophiles. Shortly after this examination he returned to work, still feeling fatigued and conscious of dull aching pain in the right side. He still had no appetite, gained no weight, and noted that in driving a car he had increased pain in his side when the car bumped even slightly.

About September 15 he began having chills and fever, followed by drenching sweats, and increased pain in the right side. He stated that he had lost no further weight since June, but had no appetite, could not do his work, and was having almost constant pain in his right side. The remainder of the history was irrelevant.

Physical Examination. The patient was a tall, well-developed, poorly nourished, pale, white male, looking to be the stated age, and not acutely ill

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† River, L. P., and Gradinger, B. C.: Am. J. Surg., 61: 297, Aug., 1943.

Fig. 1. Medial displacement of ascending colon, June 20, 1947.

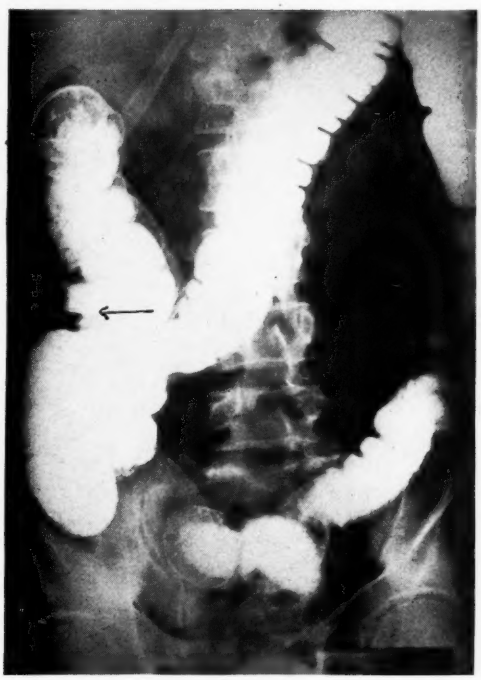

Fig. 2. Air contrast showing displacement or defect, ascending colon, Oct. 20, 1947.

Examination other than abdominal did not contribute to the diagnosis. The abdomen was flat. There was a well-healed right subcostal oblique scar, nontender. The liver, spleen and kidneys were not felt. No herniae were found. On deep palpation, laterally, in the right upper quadrant of the abdomen a large, slightly tender, fixed mass was felt. It did not move with respiration. Rectal examination was negative. The urine was negative, the red cell count was 4,600,000, white cell count was 15,000 with 87 per cent polymorphonuclear leukocytes, 12 per cent lymphocytes, 0.5 per cent eosinophiles and juvenile forms. The sedimentation rate was 34 mm. and the hematocrit reading 48 mm. The diagnosis of an appendiceal granuloma was made, and he was told to come in for further study. Two days later the excretory urogram was reported to be normal, and examination of the colon with barium enema was stated to show "what is apparently a large, indurated ulcer involving the lateral aspect of the ascending colon at a point just proximal to the hepatic flexure. The entire ascending colon at this point is displaced medially, but filled and emptied normally. There was no local tenderness over the mass felt in this region, although there was some limitation of mobility in this region." The radiologists interpreted the findings, in view of the presence of blood in two stools, as being due to a malignant tumor of the ascending colon (Fig. 2).

He entered the Oak Park Hospital Nov. 1, 1947, after he had taken 10 Gm. of phthalylsulfathiazole daily for five days. The mass was demonstrably smaller, and he had gained five pounds in weight. His blood pressure was 136/84, the temperature was 98.6, sedimentation rate 19 mm., cephalin flocculation 1 plus, total proteins 7.07 Gm. 100 cc. of blood; albumin/globulin ratio was 1.53/1. The red cell count was 4,600,000, hemoglobin 13 Gm., white cell count 4,600 with 62 per cent polymorphonuclears, 35 per cent lymphocytes and 3 eosinophiles. The urine had a specific gravity of 1.020, and showed no other abnormality except an occasional granular cast. The preoperative diagnosis was appendiceal granuloma, but it was impossible to exclude the possibility of carcinoma of the ascending colon.

Operation. Operation through a long right rectus incision was performed under cyclopropane anesthesia on November 6. The cecum appeared

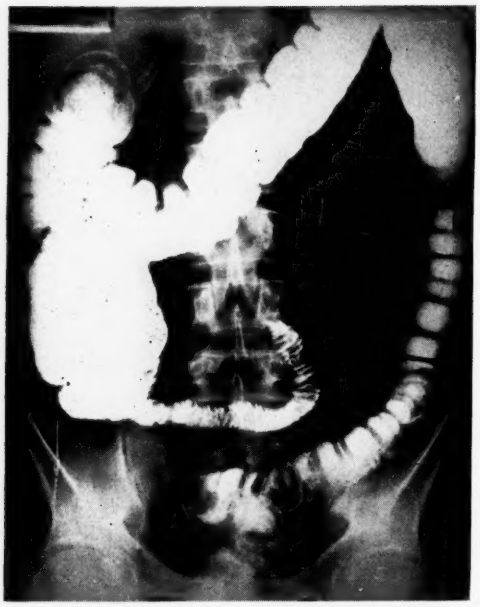

Fig. 3. Postoperative appearance, barium enema.

normal, as did most of the ascending colon. There was a considerable amount of thickening in the region of the hepatic flexure, with fixation of the mass to the posterior abdominal wall; there were no changes within the peritoneal cavity. The cecum and ascending colon were mobilized by dividing the lateral peritoneal attachment, rotated medially, and the appendix exposed. The latter was long and thick, entirely retroperitoneal and retrocecal. At a point just below the hepatic flexure both appendix and colon were involved in a granulomatous mass approximately 5 cm. in diameter. The appendix was divided at the base, the stump closed by inversion without ligation, and the distal end separated from the colon by blunt dissection. The lateral leaf of peritoneum was tacked over the raw area on the colon with several interrupted silk sutures, and the abdomen closed without drainage. Bank blood (500 cc.) was administered during the operation. The postoperative course was completely uneventful. The patient was up and about from the afternoon of the first postoperative day onward. A second pint of blood was on hand, and this was given, although the need was not obvious. He left the hospital one week after operation, and returned to his work a week after that. He felt well, completely relieved of all preoperative complaints until Dec. 28, 1947, when he became ill with a painless jaundice, mild fever, anorexia and slight diarrhea. Recovery from this apparent homologous serum jaundice was rapid, with no fever after Jan. 1, 1948, and stools back to normal by Jan. 20, 1948.

The lumen of the removed appendix was open at the base, and at the point where it entered the granuloma; section taken at this level showed only tissue characteristic of chronic nonspecific granuloma. The appearance of the colon after barium enema Dec. 18, 1947, is shown in Figure 3.

SUMMARY

1. A case history is reviewed in which an appendiculocolic granuloma is presumed to have been due to intracolic rupture of an appendiceal abscess.

2. Colon x-ray findings in such cases may be easily misinterpreted unless careful consideration is given to the history.

3. Appendectomy is curative.

4. Homologous serum jaundice may occur even with blood from banks which take a "jaundice history."

SOMMAIRE

L'auteur rapporte un cas de granulome appendiculocolique dû apparamment á la rupture d'un abcès appendiculaire. Dans les cas analogues, la radiographie du colon se prète à de fausses interprétations si on ne condère pas attentivement les détails de l'histoire donnée par le malade. L'appendectomie est curative. La jaunisse de sérum homologue peut survenir après la transfusion de sang provenant de dépots qui prennent un examen meticuleux du sang afin d'exclure cet accident.

SUMARIO

El autor presente la historia detallada de un caso de granuloma colico-apendicular cuyo origen se presume el ser la ruptura intracolica de un abceso apendicular. La radiografia del colon en estos casos puede facilmente mal interpretarse si no se toma una historia detallada. La apendectomia en estos casos es curativa.

RIASSUNTO

Riporta un caso di granuloma appendicolocolico che ritiene dovuto alla rottura intracolica di un ascesso appendicolare. In casi del genere i risultati dell'indagine radiologica possono condurre ad errori di interpretazione, se non integrati da un accurato controllo anamnestico e clinico.

La cura consiste nell'appendectomia

Intussusception of Ascending Colon

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INTUSSUSCEPTION or the telescoping of one portion of the intestine into a more distal segment is not a common condition. This is most frequently found in children under two years of age, usually between the fourth and ninth month, approximately one-half of these cases falling in this age group. The small bowel is much more frequently involved than the large bowel. The etiologic factor is still somewhat obscure in the majority of cases, but in about 5 per cent there is demonstrable some mechanical abnormality, such as Meckel's diverticulum or an intestinal polyp.

According to Alvarez's [1] metabolic gradient theory, the fundamental factor which determines the polarity of intestinal peristalsis is the metabolic activity of the intestinal muscle. The normal metabolic rate progressively diminishes distally from the duodenum along the intestinal tract to the rectum. Thus in the presence of inflammation in one portion of the intestinal tract, the metabolic rate of this portion increases and when it exceeds that of a more proximal portion, it becomes the center of polarity. Keeping this in mind, any inflammatory process may cause a powerful localized spasm resulting in constriction adjacent to or at the site of the irritation. The peristaltic waves approach this constricted segment and, being unable to pass, set the stage for the bowel to be invaginated. The waves increase in severity until a more powerful wave finally carries a small constricted segment into the relaxed distal segment.

Thorek and Lorimer [2] have shown that antiperistalsis can be as efficient in ridding the intestine of its contents as normal peristalsis and, like the normal, its force increases progressively as long as the etiologic factor is present or until the intestine becomes exhausted. Antiperistalsis occurs in all portions of the gastrointestinal tract. It occurs in the normal process of digestion in the duodenum below the cap and also for a variable distance above the ileocecal valve to check the rapid passage of ileal contents into the cecum. With this in mind, retrograde intussusception may be appreciated.

The clinical picture of intussusception may be quite clear. There is the usual sudden onset of severe pain followed by vomiting with repeated paroxysms of colicky pain and repeated vomiting. Bloody stools usually follow, with a palpable tumor mass present in the abdomen associated with shock.

CASE REPORT

On Jan. 14, 1948, a 14-year-old white boy was admitted to St. John's Hospital with the history of having been perfectly well until about five hours before. At that time he ate breakfast and enjoyed it. About an hour or so after eating he had a severe cramp in his abdomen which was quickly followed by severe vomiting, the vomitus consisting of previously eaten food. Following the vomiting, he had loose watery stools. About 1:00 P.M. he was seen by a physician who withheld everything by mouth and prescribed some sulfasuxidine tablets. The vomiting and diarrhea stopped, but the pain persisted and he was hospitalized. The morning after the onset he still had severe cramps and vomiting. This time there was a palpable mass in the right lower quadrant. A diagnosis of intussusception or volvulus was made and the patient was taken to surgery.

Under sodium pentothal anesthesia supplemented by intratracheal cyclopropane a right lower rectus incision was made and the abdominal cavity opened from which a quart or more of straw-colored fluid was aspirated. The cecum and ascending colon were identified and intussusception involving the ascending colon diagnosed. The bowel was markedly swollen and almost black in color. The ascending colon and cecum were resected and an anastomosis made between the end of the ileum into the side of the stump of the ascending colon. The wound was closed in anatomic layers.

The patient was out of bed on the fourth postoperative day and made an uneventful recovery.

Report on the pathology by Dr. Harry M. Steen, pathologist of St. John's Hospital, was as follows:

Gross Examination. Specimen consists of resected ascending colon measuring 30 cm. in length.

There is an intussusception of the proximal portion of the colon. The bowel wall is infiltrated with extravasated blood. The lumen of the gut is filled with hemorrhagic fluid. The appendix is present and grossly appears normal. The ileocecal valve is grossly normal.

Microscopic Examination. Sections of the colon show the wall to be infiltrated with extravasated blood. The mucosa shows ulceration.

Diagnosis. Intussusception of the colon.

The treatment for intussusception is immediate surgery although at times the infantile type may be reduced spontaneously. Nevertheless, there is always a lingering doubt whether reduction has been complete and recurrences are common. Tragedy often results from indecision and procrastination.

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Sección en Español

Estado Actual del Tratamiento de las Várices I Sus Complicaciones

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LIMA, PERU

LAS várices o flebectasias según la definición de Alibert i Briquet, son las dilataciones permanentes de las venas resultado de las alteraciones de sus paredes.

No vamos a tratar aquí de su compleja etiología, pero señalaremos sí, la tendencia varicosa familiar según Ochsner i Magnus; alteraciones del metabolismo, transtornos neuro-vasculares i factores endógenos de orden hormonal que intervienen, junto con la inflamación de las paredes venosas i el factor mecánico, en la producción de las várices.

In referencia que hagamos va dirigida a las várices del miembro inferior, susceptibles del tratamiento quirúrgico de acuerdo con la experiencia tenida en el Servicio de Cirugía del I-A-E del Hospital Obrero de Lima, cuyo Jefe el Dr. C. A. Protzel en compañía del Dr. Fco. Graña (Jefe del Departamento Quirúrgico) i los Asistentes del Servicio, han laborado durante cuatro años.

La terapéutica de los estados varicosos ha interesado desde antiguo a los médicos i cirujanos. A través de reseñas históricas, captaños por ejemplo que Hipócrates empleaba la compresión como medio paliativo i del cual la media elástica es su representante; como Plutarco refiere que a Mario se le extirpó una vena varicosa no tolerndo se le tratara la otra pierna por el exceso de dolor. También se nos refiere que en épocas posteriores hasta llegar a la Era Listeriana se empleabau procedimientos médicos i quirúrgicos algunos de los últimos con resultados sépticos deplorables; así por ejemplo la ligadura mediata de vena i piel de Chaumette (1627) i Ganey (1716); la ligadura simple a cielo abierto de Hame (1797) la sección simple transversal a cielo abierto por Brodie (1816) i después Velpeau; la ligadura mediata sobre cuerpo extraño (alfiler) por Davat en 1833; la sección subcutánea de las venas con tijeras empleada por Lisfranc en 1847.

Con la aparición de la jeringa de Pravaz (1850) i el tratamiento de los aneurismas arteriales por las sales férricas, mas tarde, Valette, Petrequin, Desgranges i otros, emplearon para las várices el percloruro de fierro; Negretti empleó el cloral; Tavel, la solución fenicada al 5%, etc., procedimientos que fueron abandonados a causa de la infección i embolias mortales que se produjeron. Mas tarde Sicard i su escuela a raíz de la observación de fleboesclerosis por las inyecciones de arsenicales, mercurio, etc., sin consecuencias letales, empleando el carbonato de solio hicieron resurgir este método para las várices. Por ello, se ha empleado después el clorhidrato básico de quinina por Berard de la escuela de Lyon; la quinina-uretano, el cloruro de sodio hipertónico, salicilato de sodio, dextrosa hipertónica, oleato de potasio i morruatos por las anglo-sajones (Rogers).

Los métodos operatorios propiamente surgen con la operación de Trendelenberg en 1891 con la ligadura i sección de la safena; con las de Perthes (ligadura en tres pisos); Lebderhose (ligaduras múltiples); los de Schwartz (resección escalonada); los de Ricard, Madelung, Terrier i Alglave (resección total de la safena); los de Moreschi (incisiones circulares i semejantes de Rindfleisch, Friedel, etc., con un 60% de recidivas i 20% de mejoría. Otras técnicas, como las de Babcock, Mayo, Vaquiez, Bopp, tenían un 40%

de beneficio. Por último, como valor histórico señalaremos la operació de P. Delbet (anastomosis safeno-femoral) difícil i peligrosa.

Los métodos combinados: operación e inyección de sustancias esclerosansurgen desde 1903 con la técnica de Schiassi i su solución yodo-yodurada (yodo metaloide 1 gr., yoduro de potasio 1.60 gr., agua destilada 100 cc.); después Takats con la esclerosis tardía por el oleato de potasio al 5–10%; Pratts (solución quinina-uretano), Stanton-Sherman, Ochsner-Mahorner, que son actualmente los métodos de elección puesto que el método esclerosante tiene una mortalidad despreciable de 0.013% según McPheeters i Rice en 53 mil casos o sin mortalidad en los 20 mil de Kilbourne. Esto dicho, unido a la asepsia i antisepsia con un método quirúrgico bien reglado que cumpla, en los estados varicosos, *con los fines de la intervención quirúrgica,* cuales son:

1° obliterar las venas varicosas
2° ligar o extirpar i
3° modificar las condiciones fisiopatológicas creadas por la insuficiencia valvular, hacen actualmente a estos métodos, los de elección.

Refiriéndonos a estos métodos actuales para el tratamiento de los várices i sus complicaciones, es importante anotar que incluídos en *el preoperatorio,* juega importante papel el estudio de las pruebas de suficiencia venosa superficial, suficiencia profunda i de las comunicantes, empleando los test bien conocidos por la sapiencia vuestra como son los de Trendelenberg i sus variantes (entre ellas la de la escuela argentina de Finochieto), la maniobra de Perthes, la prueba de Pratts o la de Mahorner-Ochsner, para tener al menos, una base de intervención puesto que muchos de los fracasos, con recidivas por consiguiente, se debe a la nueva repleción venosa por retorno de la sangre ya sea a favor de las comunicantes o de las colaterales. Por ello debe pues localizarse el lugar de la insuficiencia venosa.

Hoi día además, Lesser i Danelius de Walla-Walla, Washington, emplean *un método flebográfico,* que nosotros hemos empleado también, para indicar en la película las comunicantes insuficientes, muchas de las cuales han pasado desapercibidas con los test antedichos. Su técnica consiste, en: coger la vena por detrás del maleolo interno o en el dorso del pié disecándola si es posible con anticipación i colocándo en ella una cánula para que no salga hasta inyectar el medio de contraste en la sala de rayos X; inyectar Diodrast o Nosylan al 35% (Acido N-acético 3–5 bi-yodo piridina-dietanolamina) primero 1 cc. esperando 15 segundos para contemplar alguna intolerancia; luego introducir los 29 cc. restantes en 45 segundos. Tomar tres placas radiográficas escalonadas que se han colocado contiguas a la pierna muslo i parte de pelvis, tan pronto se ha concluído de inyectar el Nosylan. Desarrollar las placas.

Si no se empleara este poderoso medio auxiliar, es conveniente ya en el mismo acto operatorio, tener presente que existe un vaso constante como es la *vena perforante media del conducto de Hunter* según los estudios anatomo-quirúrgicos de Stanton-Sherman de San Francisco de California, la cual vena comunica la circulación superficial con la profunda a nivel mas o menos de la unión del torcio superior con el tercio medio del muslo. Igualmente, aunque no es constante, existe otra vena mas inferior que pone en relación el plexo geniculado interno de la rodilla con la vena sub-sartoria i va a desembocar en la femoral encima del anillo de tercer aductor.

Nosotros creemos que una de las causas de las recidivas que se ha tenido en el Servicio a pesar de emplear las técnicas de Moreschi, Terrier i Alglave, Mayo, Schwartz, Pratts, Ochsner, etc., se debe a la falta de consideración de las comunicantes descritas i su consiguiente ligadura.

Actualmente nuestros enfermos varicosos se tratan de acuerdo con el diagnóstica del *grado de las várices* i sus complicaciones, teniendo en cuenta *la circulación* profunda i estado de las comunicantes, asi como para el empleo de las *sustancias esclerosantes,* la consideración de las contra-indicaciones i posible estado de sensibilización. (Mahorner-Ochsner observan con los morruatos un 3% de reacciones alérgicas de la piel i además en algunos casis hai colapso vascular severo con vaso-espasmo de la extremidad.)

Los casos de várices de segundo grado, no mui extensas, lineales o poco tortuosas, sin

muchas colaterales, las tratamos con inyecciones esclerosantes de morruato de sodio al 5% en dosis ascendentes semanales a partir de 0.5 cc. o 1 cc. hasta llegar a 6 u 8 cc.

Hemos pasado por el tratamiento esclerosante teniendo en cuenta la escasa o ninguna mortalidad, asi como considerando las contra-indicaciones. De la primera ya nos hemos referido a McPheeters (0.013%), Kilbourne (0%), agregando aquí Hayes de Minnesota en 30 mil inyecciones no ha observado casos fatales. Entre nosotros tampoco, por relicidad se han presentado, recidivando sí como ha sucedido con otros autores. De las segundas, o sean de *las contra-indicaciones* de las sustancias esclerosantes inyectables recordamos la edad avanzada, los cardio-renales, el embarazo, la flebitis profundas ya habidas o un estado infessioso actual.

Las várices de tercer grado, avanzadas, lo mismo que aquellas complicadas con úlceras simples o recidivadas, eczemas pertinaces o con transtornos de los tejidos vecinos: nervioso, muscular u óseo, etc., las hemos tratado con la técnica quirúrgico-esclerosante (efectuamos pruebas funcionales venosas o la flebográfica, ligando las comunicantes bajas); en las soluciones de continuidad, previamente preparadas, aplicamos injertos de Corachan o los de Thiersch; también movilización de planos profundos por pensar nuestro Jefe del Servicio que con las adherencias i la tensión de los tejidos con la marcha(se producen micro-hemorragias que favorecen la recidiva de las úlceras. A veces en el post-operatorio agregamos para las venas varicosas superficiales algunas sesiones de morruato.

La última técnica quirúrgica-esclerosante aludida líneas atrós, la realizamos en los tiempos siguientes:

1° Anestesia: raquídea o local.

2° Incisión A, para la ligadura alta i sección de la safena i los afluentes que desembocan en el cayado.

3° Inyección retrógrada estrictamente venoca por el cabo distal safeno de 5 cc. de solución de sodio al 5%.

4° Incisión B, inferior del muslo para la ligadura i sección de las venas comunicantes profundas que van al conducto de Hunter.

5° Cierre de las heridas previa correcta hemostasia.

6° Si existe úlcera, aplicación de injertos de Corachan o Thiersch, de inmediato o en otra sesión quirúrgica.

Las operaciones practicadas en el Servicio durante cuatro años, sobre un total de *cerca de doscientos enfermes*, han sido de las mas diversas.

Los datos estadísticos que a continuación expresamos se refieren a ciento cincuenta historias clínicas que han sido revisadas cuidadosamente, excluyendo el resto por no encontrarse datos concretos. Para facilidad de la exposición en el cuadro adjunto se exponen en síntesis lo que vaños a expresar:

1. *La Edad* de nuestros pacientes ha sido tomada a partir de los 14 que es la mínima para los efectos del Seguro, hasta mas de 50 (La edad máxima en el Seguro se considera con los 60 años).

Encontramos que entre los 14 i los 20 solo hai un paciente, o sea 0.66%; (b) entre los 21 i 30 se consignan 51 o sea el 34%; (c) entre 31 i 40.36 enfermos o sea el 24%; (d) entre los 41 i 50.36 enfermos o sea el mismo 24% i (e) 26 varicosos en pacientes de mas de 50 años o sea un 17.3%. Luego, el mayor porcentaje de enfermos varicosos, se presenta en los asegurados entre los 21 i 30 años o sea en la tercera década de la vida. Curtius encuentra que los varicosos son mas numerosos cuanto mas edad tienen, v.g.: 1.01% entre 15 i 25 años en comparación de 24% en los pacientes con mas de 40 años de edad.

2. En cuanto al *Sexo*, hemos tratado con 134 varones o sea un 89.33% i solamente con 16 mujeres que son 10.67%. Por lo tanto, no podemos relacionar lo concerniente al sexo i estudio de las várices por la gran diferencia de número con que hemos actuado.

3. *El Tiempo de Enfermedad*, lo hemos tomado entre los dos meses i mas de 30 años anotándose 25 pacientes en los cuales no se ha podido determinar dicho tiempo.

Podemos decir que nuestro mayor porcentaje (37.33%) de enfermos se presenta para ser operados con un tiempo de evolución de sus várices entre los primeros 5 años.

4. En lo que se refiere a la *Raza* de nuestros

pacientes, hemos tratado en su mayor parte el mestizaje que predomina en la gran masa de asegurados (94%). Las otras, blanca, negra o amarilla constituyen escaso número.

5. Tenemos en *la Incidencia Segun la Pierna Afectada,* hemos encontrado un porcentaje de 40% para la pierna izquierda con un 7% más sobre su opuesta. En este predominio de las várices en la pierna izquierda, coincidimos con la mayoría de los investigadores, no así con Ochsner i Mahorner, para quienes no hai predilección.

6. *La Incidencia Segun el Sistema:* Entre Nosotros, las várices del sistema safeno interno unilateral ha sido de predominio saltante (70.66%) sobre los otros sistemas, con forme puede verse en el cuadro.

7. *Las Várices Complicadas,* han predominados entre los asegurados en ecuanto a las úlceras se refiere, pues tenemos que les ha correspondido un 53.3% de los casos, con una insignificancia de otras complicaciones.

8. *Las Reacciones Serologicas* de Wassermann i Kahn han sido positivas solo en 12%, siendo las de Mazzini igualmente positivas en 4.66%. Luego, en la mayoría de nuestros pacientes hemos operado con sero-negatividad (80%).

9. En lo referente a las *Tecnicas Operatorias Empleadas* i su resultado en nuestros ciento cincuenta pacientes estudiados, tenemos lo siguiente: (1) Con *la safenectomía* en los varicosos operados por nosotros, ha existido un 80% de recidivas, cifra elevada por lo tanto; del resto no tenemos noticias exactas como para poder comentarlas. (2) Con la *ligadura alta de la safena i las colaterales* que abocan al cayado hemos encontrado un 20.83% de recidivas, lo que ya significa un buen éxito operatorio. (3) Con *la misma técnica,* pero *agregando* inyección de *morruato al 5%* 5 cc. por el cabo distal safeno, tenemos, si es cierto con menor número, el mismo porcentaje de 20.83% de recidivas en nuestros operados por lo tanto semejante portentaje de éxito. (4) Con la *ligadura alta de la safena* i sus colaterales del cayado pero *ligando las comunicantes* profundas inferiores, en ocho enfermos, no hemos tenido hasta la fecha, recidivas. (5) Con la *ligadura de las comunicantes i morruato en* el cabo safeno inferior para los casos ya operados con la ligadura alta i recidivados, tenemos que con ocho enfermos el éxito ha sido remarcable pues no se han presentado recidivas. (6) Por último i para poder comparar con lo anterior, decimos que con la *técnica de Moreschi* encontramos un 100% de recidivas. En nuestro cuadro pareco paradojal que encontremos mayor número de recidivas que pacientes anotados, pero ello se debe a que otros dos pacientes fueron operados en otros hospitales i al revisar sus historias clínicas ellos habían recidivado como nuestros seis pacientes operados.

10. En cuanto a los *otros tratamientos efectuados,* ellos han sido diversos, entre los que anatamos: (1) La resección de la úlceda con un 100% de recidivas en nuestros dos casos. (2) La simpaticectomía lumbar i simpaticotomía peri-arterial de Leriche con un 50% de recidivas en cuatro casos anotados. (3) Con la aplicación de injertos de Thiersch o Corachan en los tejidos ulcerosos ya preparados, hemos tenido 44.4% de recidivas. (4) En un solo caso hemos empleado *la radioterapia* sin encontrar en él la mejoría o curación que esperábamos. (5) Se ha movilizado en ciertos casos los planos profundos incluso a veces con la resección de un segmento óseo que en algunos pacientes han estado afectados así como otros tejidos (muscular, nervioso, etc.), obteniendo en tres pacientes una curación evidente.

11. En cuanto a los *complicaciones postoperatorias,* debemos hacer resaltar que en nuestros ciento cincuenta casos aquí estudiados, las temidas flebitis o tromboflebitis no las hemos conocido en esos pacientes, por lo cual con satisfacción anatamos: cero por ciento. Solo tenemos que consignar entre las complicaciones postoperatorias una discreta infección local asi como una linfangitis, consecutiva a una safenectomía.

De la exudación de la herida operatoria por la retención de hilo o mala calidad del cat-gut para la hemostasia, apenas si vale la pena consignarlas en este lugar porque se han presentado en un escaso número de operados i estrictamente no son complicaciones postoperatorias sino que caerían dentro de la evolución de la herida.

12. *La Permanencia Hospitalaria* ha sido relativamente corta pues la mayoría de nuestros pacientes (42.66%) ha permanecido entre 10 i 20 días, incluyendo en ellos el tratamiento de afecciones concurrentes: bronquitis, acarosis vecinas, impétigo, sepsis oral, etc., o espera de exámenes de laboratorio o citas para las radiografías venosas, etc., que no es del caso consignar.

Como un dato omitido en la exposición anterior, agregamos lo relativo a las ocupaciones de los pacientes, que son:

	Casos	%
De pie	125	83.3
Sentados	20	13.3
Otros	5	3.3

CONCLUSIONES

1. Las várices avanzadas en los pacientes del Hospital Obrero de Lima, se presentan en mayoría entre los 21 i 30 años, para descender en número conforme se avanza en edad.

2. Nuestros casos mas numerosos se presentan con antecedentes de 1–5 años de enfermedad, para decrecer casi, en 50% con el mayor tiempo si aumenta de 5–10 años.

3. La pierna izquierda os mas afectada que la derecha en cuanto a las várices, con un 40% del total.

4. De los sistemas venosos safenos del miembro inferior, el interno unilateral predomina en casi 71% de los casos.

5. Las úlceras varicosas constituyen una mortificante complicación en 53.33% de los pacientes.

6. Para el éxito del tratamiento de las várices avanzadas, es necesario emplear el método combinado quirúrgico-esclerosante, previo estudio de la circulación venosa superficial i profunda.

7. Nos permitimos recomendar este método con el agregado de injertos en los casos necesarios de úlceras varicosas.

Editorials

Sludged Blood

AFTER 16 years of study of the circulating blood in the organs of experimental animals and on the bulbar conjunctivae of human beings a report * has been published which throws new light on the properties of normal blood, blood flow and vessel walls. The observations were made by transillumination with light-conducting fused quartz rods under a magnification of 16 to 100 times. In human beings the unanesthetized bulbar conjunctivae were observed with binocular microscopes and oblique illumination of the universal slit lamp or ophthalmoscope lamp.

The authors report that in normal blood and normal vessel walls erthyrocytes tend to repel each other slightly; that rouleau formation does not take place in carefully handled tissues; that normal red blood cells in healthy young human beings were not coated with microscopically visible protein precipitate; that neither red nor white blood cells cling to the walls of small vessels; that the inner surface of small vessels is smooth and clean.

Normally, unagglutinated blood flow was stream-lined, the cells being arranged in concentric laminae, the center one passing along most rapidly. It was found that the rates of blood flow through each tissue of each organ set the maximum rate at which the cells of that tissue can receive blood-borne materials.

A crude but accurate criterion for adequate rates of blood flow through open-tissue capillaries was the fact that in most arterioles and venules 60 to 120 μ in diameter blood flowed so rapidly that individual red cells could not be seen. It was found that almost every arteriole-to-capillary or sinusoid-to-venule pathway could contract so tightly as to resist the entrance of blood, and that individual parts or all its parts could dilate maximally, the limits of physiologic dilatation being fixed by the elastic limit provided by the mesh of connective tissue fibers surrounding each arteriole. Most capillaries were able to dilate without losing tonus but not much more than two or two and a half times the diameters of the animal's own erythrocytes. This applies also to the bulbar conjunctivae of human beings in whom red blood cells usually measure 8 μ in diameter. Hence, in health and disease the arterioles and capillaries constitute a perpetual bottleneck.

In a variety of acute and chronic diseases of lungs, heart, gastrointestinal tract, thyroid and blood, as well as in tuberculosis, hypertension, leukemia, etc., blood cells were found to be agglutinated into masses (not rouleaux), changing the blood from its normal relatively fluid state to a circulating sludge. Sludged blood was found in 12 of 21 women with normal pregnancy whereas of 23 women with various complications of pregnancy sludged blood was found in 22. In a large number of patients studied, arterioles were found temporarily and permanently plugged with masses of sludge and in some short spindle-shaped bulges (aneurysms) of arterioles. Red and white cells were seen sticking to the lining walls of vessels, and circulating masses of agglutinated white and red cells were seen to enter and plug small arterioles with subsequent dilatation, bulging, sacculation and leakage of fluid into surrounding tissue. Where sludging of blood had advanced there was evident slowing of circulation.

In an effort to determine how sludged blood damages the body certain concepts were developed: (1) the resistance of sludged blood to its own passage through the bottlenecks of the circulatory system forcibly reduces the rates of blood flow through all the open vessels of the body. (2) Agglutinated red cells are ingested and destroyed in the phagocytic cells

* Kniseley, M. H., Bloch, E. H., Eliot, T. S., and Warner, Louise: Sludged Blood, Science, **106**:431, Nov. 7, 1947.

of liver and spleen. (3) There is settling and sedimenting of masses of agglutinated blood cells out of the moving blood plasma during life. (4) Various degrees of reduction in circulating blood volume caused by (1) and (2) initiate intermittent, prolonged, controlled shutting off of the arterioles of a selected series of tissues and organs.

Detailed studies were made on various sludges and their effect in the body. For instance, it was found that no patient with grossly visible edema during bed rest failed to have large semirigid masses, visibly slowed rates of blood flow through the conjunctival vessels, different degrees of plasma loss through the vessel walls and of microscopically visible hemoconcentration, conjunctival edema, etc. In a number of deeply comatose human hospital patients the blood was seen to have been agglutinated into large, sticky, pasty wads moving very slowly through rapidly leaking vessels. These are only two of a wide variety of highly interesting findings reported.

The authors emphasize that the hope provided by these studies is that as we learn how to keep blood normally unagglutinated and fluid, vessel walls intact, normal red cells from being destroyed, and adequate blood volume present, many effects of other pathologic mechanisms will stand out unobscured by the sludge mechanisms. This opens the field to intensive investigation of sludges by the methods available today.

Until the sludge mechanism has been thoroughly investigated any therapeutic attempts to combat sludging by the administration of anticoagulants should be highly experimental.

L.G.

Surgical Implications of Acute Infectious Hepatitis and Its Residual Manifestations

THERE is great need for a wider acceptance clinically and for a more thorough understanding of hepatic insufficiency in its latent and apparent stages and in the broadest possible sense. As an important factor in the resistance to the stresses and strains of large scale operations, and in the successful outcome of the latter, the role of this disability is tremendous and should be more and more understood.

Study of acute and chronic hepatitis has been stimulated by the extraordinary abundance of clinical material provided by a pressing war time and postwar problem. Ideas regarding latent and subclinical forms of liver diseases have been confirmed. New knowledge has been gained about the development of the essential pathology by the increased use of serial and repeated aspiration liver biopsies, and the pathologic physiology of the liver related thereto has been made clear by comparison of the anatomic pictures so visualized with reliable old and more sensitive new tests of liver function. Now the clinical concept of these forms of hepatitis fully approximates that of other forms of visceral disease. It seems advisedly necessary to recapitulate the entire picture.

Acute infectious hepatitis in any form is a primary liver disease. Lichtman [1] distinguishes this from liver disease secondary to other disease entities (e.g., cardiac disease, hyperthyroidism, malaria, etc.), or considers it an associated type (hepatorenal disease, Wilson's disease, etc.). The pathology in each is distinct but the clinical effects frequently are identical.

In the prodromal and preicteric stage of acute infectious hepatitis, it is common to observe chills and fever reaching to daily

1. Lichtman, S. S.: New York Med. 3:19, 1947.

peaks of 102° F. for a number of days, accompanied by headache, weakness, malaise, and generalized aches and pains. There are frequent upper respiratory symptoms of rhinitis and sore throat, and lower respiratory signs of cough, chest pains and occasional rales referable to the lungs. It is common to mistake these preliminary signs for those of an influenzal infection.

When the disease is fully formed, there are: gastroenteric symptoms of pyrosis, nausea and vomiting, eructations and postprandial distress; upper and lower abdominal pain and cramps, diarrhea and undue expulsions of gas. Then the dominating liver symptoms of jaundice and biliuria with all the usual accompanying laboratory evidence appear and continue.

With this come the parts of the picture which are not usually emphasized. There is frequent mention of splenic enlargement (Jossem,[2] Wayburn,[3] Lucké,[4] Finks and Blumberg,[5] Goodman,[6] Klatskin and Rappaport[7] and others). This was determined by palpation, x-ray and necropsy examination. The reported numbers of splenic enlargement vary from 48 to 75 per cent of the total number of cases of hepatitis observed. Inasmuch as the enlargement may be of small extent, and/or was not observed and reported, it is not too much to assume that some degree of splenic enlargement occurs in a number sufficient to make it an almost universal manifestation of the disease.

There are a number of reports in which enlargement of the lymph nodes is mentioned. Barker, Capps and Allen[8] observed this in 81 per cent of their cases; and the pathologic nature of such involvement was described by Fox[9] who saw reticuloendothelial hyperplasia at necropsy.

Alterations in the hematopoietic system in hepatitis have been observed by many. As long ago as 1923 such changes were described by Jones and Minot[10] and reviewed by Goodman[6] in 1947. The signs noted included diminutions in the red cell count (3 to 4 million) and in the hemoglobin content (12 to 13 Gm.) which is most marked shortly after the peak of the jaundice. There is also an increase in the platelet count. After a preliminary slight white cell increase there follows a leukopenia with a relative increase in the lymphocytes (up to 50 per cent) and large mononuclears (up to 12 per cent). The most characteristic feature is the occurrence of immature and abnormal lymphocytes and large mononuclears. In Goodman's cases the Paul-Bunnell test was always negative.

Simultaneous enlargement of liver and spleen has been noted by Landolt[11] in infectious mononucleosis and the resemblance to hepatitis seems to be strengthened since in the former urobilin and urobilinogen also are frequently present in the urine. Apparently this phenomenon, too, has been noted by Goodman. In discussing hypertrophic cirrhosis of the Hanot type, unassociated with calculous disease and infection in the major ducts, similar simultaneous enlargement of liver, spleen, lymph nodes and pancreas have been noted in the literature by Wilensky.[12]

Goodman correlates the data regarding etiology, symptomatology and pathology of acute hepatitis, and emphasizes the simultaneous involvement of spleen, liver, bone marrow and lymph nodes which are the principal components of the reticuloendothelial system. Nevertheless, his visualization, of acute infectious hepatitis "as a disease . . . with pathologic alterations in the component parts of the reticuloendothelial system" cannot be well taken, because in acute infectious hepatitis there is a host of observations to show that anatomically the intralobular framework of the liver, which is part of the reticuloendothelial system, is always intact and apparently unaffected, and that the lesion is exclusively a disease in which the parenchymal cells alone are destroyed.

This anatomic distribution of the lesions in

2. Jossem, J., Harefuah: J. Palestine Jewish M. Assoc. 19:25, 1940 (cited by Cameron, J. D. S.: Quart. J. Med. 12:139, 1943.
3. Wayburn, E.: Gastroenterology 4:147, 1945.
4. Lucké, B.: Am. J. Path. 20:595, 1944.
5. Finks, R. M., and Blumberg, R. W.: Arch. Int. Med. 76:102, 1945.
6. Goodman, J. I.: Am. J. Dig. Dis. 14:26, 1947.
7. Klatskin, G., and Rappaport, E. M.: Ann. Int. Med. 26:13, 1947.
8. Barker, M. H., Capps, R. B., and Allen, F. W.: J.A.M.A. 128:997; 129:653, 1945.
9. Fox, J. P., Manso, C., Penna, H. A., and Para, M.: Am. J. Hyg. 36:68, 1942.
10. Jones, C. M., and Minot, G. R.: Boston M. & S. J. 189:531, 1923.
11. Landolt, R. F.: Schweiz. med. Wchnschr. 72:1346, 1942; abstr. J.A.M.A. 123:176, 1943.
12. Wilensky, A. O.: Am. J. Digest. Dis. 14:74, 1947.

acute hepatitis corresponds, from a vascular standpoint, with the territorial arterial supply of the mesenteric axis. It is interesting to speculate upon the possible pathogenetic significance of this anatomic fact. It probably bespeaks an approach of the causal agent through the arterial stream of the mesenteric axis. This seems to indicate a hematogenous infection, and the common occurrence of prodromal upper and lower respiratory manifestations may indicate the entry of the causal agent through the nasopharynx. It definitely denies a distribution through the portal vein and its tributaries, and probably predicates that the causal agent is not absorbed from the alimentary canal.

The statement usually made (Lucké and others) that the largest proportion of cases of acute hepatitis recover completely is contradicted by other observers (Kalk,[13] Sofer,[14] Kornberg,[15] Altschule and Gilligan,[16] who found impairment of liver function in a high proportion of those who were considered to have recovered from the acute attack. In various groups and in various combinations this was associated with hepatomegaly or with other symptoms.

In individuals with severe and protracted jaundice during the acute phase, there was a significant higher incidence of residual manifestations than in the others. There was no perceptible difference in cases with single episodes of jaundice as compared with those having multiple attacks of jaundice. Apparently the time element is very important in determining the susceptibility of the liver to a second injury. If sufficient time has elapsed the susceptibility may be normal, even if complete structural and functional restoration has not taken place.

Hepatomegaly alone and/or hepatosplenomegaly in any combination is decisive evidence of previous or present liver disease even if symptomless at the moment. The clinical significance of the enlargement must be integrated, however, with the symptomatology and with all laboratory data. Residual symptoms, aggravation of symptoms, or recurrences of symptoms accompanied by increased tenderness of the liver, indicate the latency of the underlying condition in the symptomless periods. The flaring up of symptoms in some of these cases may be directly attributed to undue stress of any kind (e.g., an operation).

A great variety of symptoms have been attributed by Kalk to the residual damage in the liver following an attack of acute hepatitis. Klatskin and Rappaport found that only fat intolerance and pain could be considered significant because the other symptoms could not be traced to an attack of jaundice or to other pertinent factors. Only moderate or severe degrees of discomfort were considered significant. Fat intolerance was by far the most striking and frequent symptoms. Pain was associated most commonly with fat intolerance and was poorly localized in the right upper quadrant and epigastrium. Objectively, hepatomegaly was present in a large percentage and in some splenomegaly was present also.

Confirmation of the presence of liver damage is always dependent upon the demonstration of aberrations of liver function. Inasmuch as no known single test is capable of showing abnormal liver function accurately and decisively, because the various tests react differently and with varying intensity in different individuals, it is necessary to study liver function by all the methods available. In many clinics a working estimate of liver function is made by determining and integrating the one-minute and total serum bilirubin estimations, the cholesterol and cholesterol ester content, the thymol turbidity and cephalin-cholesterol flocculation reactions, the bromsulfalein excretion, the quantitative urinary urobilinogen excretion, and the total serum proteins and albumin-globulin ratio. In any event, a single observation is of little or no clinical importance, but a series of repeated observations, combined with aspiration liver biopsies, give important evidence of the continued development or possible retrogression of the essential lesions.

It seems true, that under conditions of advanced disease, functional hepatic failure

13. Kalk, H.: Deut. med. Wchnschr. 58:1078; 57:1119, 1932.
14. Sofer, L. J., and Paulson, M.: Arch. Int. Med. 53:809, 1934.
15. Kornberg, A.: J. Clinical Invest. 21:299, 1942.
16. Altschule, M. D., and Gilligan, D. R.: New England J. Med. 231:315, 1944.

occurs and is analogous to cardiac failure. Hepatic failure is not always predictable, but when such an event is suspected the imminence of the complete breakdown may be gleaned from an integrated consideration of all the symptoms and observable signs, with the results of all available forms of laboratory investigation of liver function. When any form of surgery is contemplated, this item becomes a matter of utmost importance and cannot be minimized. Many surgical operations are unsuccessful because of hepatic failure.

The nature of residual and recurrent manifestations sometimes is difficult to evaluate properly. This is enhanced moderately often, especially in service and ex-service individuals in whom one must distinguish between hepatitis and yellow fever jaundice, or homologous serum jaundice, or arsenotoxic hepatitis, or chronic poisoning with atabrine, or must decide that the hepatitis is associated with one of the latter. When the interval between the original episode of hepatitis and the later secondary manifestations is of long duration one must also decide if this be a residual or recurrent manifestation or whether it is a fresh reinfection.

Several observers (Caravanti,[17] Benjamin and Hoyt [18]) have denied the relationship of these symptoms to a chronic, latent, or residual liver damage because many of the patients with psychogenic factors also had hepatomegaly and impairment of liver function. Kalk notes that the clinical picture of the hepatitis cases frequently simulates that of a psychoneurosis, and thinks that the symptoms of the latter result from the aberrations of liver structure and function. In the cases coming under my observation I noticed this apparent psychoneurotic behavior. Lichtman interprets the symptoms as an "effort syndrome" in which the individual focuses his complaints upon the liver and gastrointestinal tract rather than upon the heart. Sherlock and Walsh [19] describe patients who by continued practice learn to push their abdominal organs down so that liver and spleen of normal size become palpable and therefore, erroneously, are considered to be abnormally large.

There is debate over the question of whether infectious hepatitis may go on to cirrhosis. Most workers in the field (Kalk, Sofer and Paulson, Altschule and Gilligan, Polack,[20] Dible, McMichael and Sherlock [21]) take the view that the "vast majority of nonfatal cases of acute hepatitis go on to clinical recovery, that a variable proportion of these have residuals which are compatible with good health, but that occasionally the latter are progressive and result in cirrhosis." Lucké's experience fosters the view that cirrhosis never occurs. Undoubtedly in some instances, at least, the differences are due to diverse interpretations of the visible connective tissue changes, and, possibly, to the multiple terminologies in which "cirrhosis," nodular hyperplasia, bile-duct proliferation and fibrosis of the portal tracts are confused. Klatskin and Rappaport could find no instance of proved Laennec's cirrhosis in which they could unequivocally establish a diagnosis of acute infectious hepatitis at the onset of the disease. In many they found evidence that the cirrhosis antedated the onset of an infectious hepatitis. Lucké also saw this. In nodular cirrhosis, however, the evidence clearly indicated that the cirrhosis was a sequel of infectious hepatitis. I believe, myself, that some of these changes are undoubtedly scarring. By the same token, I believe that if the causal agent gets out into the lymphatic channels in the interlobular sept, the resultant lymphangitis may eventually cause chronic hypertrophic connective tissue changes which are the basis of cirrhosis of the portal type.

At any rate, the observations indicate that acute hepatitis is a very severe lesion; that its effects continue in many much beyond the period of its apparent cure; that residual symptoms are common, and recurrences and renewed infection appear at various intervals for long periods of time; that in some, at least, a real permanent cure never takes place; and that even functionally compen-

17. Caravati, C. M.: Southern M. J. **37**:251, 1944.
18. Benjamin, J. E., and Hoyt, R. C.: J.A.M.A. **128**:319, 1945.
19. Sherlock, S. P. V., and Walsh, V.: Lancet **2**:482, 1946.
20. Polack, E.: Acta med. Scand. **93**:614, 1937.
21. Dible, J. H., McMichael, J., and Sherlock, S. P. V.: Lancet **2**:402, 1943.

sated latent, or subclinical cases are especially vulnerable to all hepatotoxic agents and renewed infection. These individuals are not well and complain so much and so constantly that their manifestations may be improperly considered as an emotional disturbance, and regrettably attributed to a psychoneurosis.

There is also the further necessity of integrating the old knowledge with the new experience, especially from the point of view of establishing the possibility or improbability of any subsequent connective tissue change of the nature of a cirrhosis.

In any event it seems that the statistics showing cures of acute hepatitis up to 85 and 90 per cent, will ultimately need considerable revision both from the standpoint of cure of the cellular destruction, and the possible late formation of connective tissue changes in the liver framework approaching those seen in the frank cirrhoses.

The surgical significance of all this seems apparent. These residual cases are commonly of no, or very little, subjective recognition, or objective demonstration, and frequently are latent or subclinical conditions. It will undoubtedly come to pass that cases will present themselves for operations of greater or lesser magnitude for various indications unrelated in any way to any liver disease, and the incidental presence of the latter may be sufficient to cause unexpected disturbing events during the recovery from the operative insult, the healing of the wound, and in the protracted convalescence. In other more advanced cases, the imminence of hepatic failure is not recognized, operation is proceeded with, and fatalities then occur because hepatic failure is, except in rare instances, the irreversible stage of this disease. When the possibility of hepatic failure is recognized or suspected, operation should be refused as the risk is almost, if not entirely, absolute. In ex-military men this should have special significance and when such individuals are faced with any large scale operation, the condition, function, and possible anatomic change in the liver should be thoroughly investigated, and any discovered abnormality be corrected as much as possible.

Again a different form of difficulty arises in such individuals when there has been a preceding operation for gallbladder and calculous disease. Should symptoms occur later one must distinguish between a postcholecystectomy syndrome and/or recurrent postoperative cholelithiasis and residual or recurrent manifestations following the acute hepatitis or whether both of these conditions coexist. The symptomatology is similar even to the presence of jaundice. Nevertheless, the differentiation is most important and desirable if unnecessary operations are to be avoided, if proper precautions are to be taken when the latter are obligatory, if unsuspected or predictable untoward and dangerous postoperative effects are to be avoided or lessened, and if fatalities are to be prevented, or their number brought to a minimum.

A. O. WILENSKY

News Notes

The **Sixth International Assembly of the International College of Surgeons** took place in Rome, Italy, from May 16 to May 23, 1948. It was followed by three "Surgical Days" in Turin, to commemorate the contributions to surgery of Profs. Carle, Uffreduzzi and Donati. The Rome Assembly was held under the Honorary Presidency of Prof. Rafaele Bastianelli and the active Presidency of Prof. Rafaele Paolucci.

The attendance exceeded expectations. The scientific papers, the clinics, the social activities contributed to the success of the occasion. A reception of the entire Assembly by the Pope was held in the Vatican.

A detailed report of the activities of the Assembly will be published in the next issue of the *Journal.*

The **International Society of Orthopaedic Surgery and Traumatology** will hold its Fourth Congress in Amsterdam, Holland, Sept. 13 to 18, 1948. Any orthopedic surgeon who may be in Europe during the time of the Congress is invited to attend the scientific sessions and social functions of the Congress. Surgeons who wish to attend are requested to notify Dr. J. Delchef, Secretary General of the Society, Rue Montoyer 34, Bruxelles; Dr. J. D. Mulder, Secretary of the Congress, Vondelstraat 75, Amsterdam, Pays-Bas; or Dr. Henry W. Meyerding, President of the Congress, 102–110 Second Ave., Rochester, New York, of intention to attend, time of arrival, etc., so that reservations may be arranged. An interesting program of scientific papers and entertainment is being prepared.

Following the recent meeting in New York of the **Council** of the **World Medical Association**, members of the Council and their wives visited the Mayo Foundation in Rochester and the University of Minnesota. Members of the visiting party were Dr. and Mrs. T. C. Routley, Canada; Dr. and Mrs. O. Leuch, Switzerland; Dr. and Mrs. John Yui, China; Dr. and Mrs. L. G. Tornel, Spain; Dr. and Mrs. D. Knutson, Sweden; Dr. and Mrs. S. C. Sen and daughter, India; Dr. J. A. Pridham, England; Dr. A. Hartwich, Austria; Dr. E. Marquis and Dr. P. Cibrie, France; and Dr. J. Stuchlik, Czechoslovakia.

Dr. **Joseph J. Toland, Jr.**, of Philadelphia, F.I.C.S., has been elected to honorary fellowship of the Gesellschaft der Aerzte of Vienna, Austria.

Dr. **Charles Arnold**, Hon.Prof. of Surgery, West China Union University, Chengtu, Szechwan, China, has been appointed surgical consultant. The appointment came from the Surgeon General in Washington, with the request that Dr. Arnold also visit all army hospitals in the Far East and give a course of lectures to the staff in each place.

The **Fifth Inter-American Congress of Surgery** will be held at La Paz, Bolivia, from Oct. 12 to 21, 1948. Surgeons are invited to attend. Dr. Daniel Bilbao is Vice-President, and Dr. Enrique Berrios is Secretary General of the Congress.

The appearance of Volume I, 1948, of the **Harofe Haivri**, The Hebrew Medical Journal, inaugurates the twenty-first successful year of its publication under the editorship of Moses Einhorn, M.D. The founders had faith in the vitality and growth of modern Hebrew and foresaw that a Hebrew medical publication would be of service to the future medical department of the Hebrew University and of value in the development and advancement of Hebrew medical literature. Original articles are summarized in English to make them available to those who are unable to read Hebrew.

New Books

Pye's Surgical Handicraft. Edited by Hamilton Bailey, with 43 contributors, Ed. 15, Baltimore, The Williams and Wilkins Company, 1947. This unusual "handbook" has accomplished what others have attempted but failed to do. It has condensed many valuable technical procedures and an extraordinary variety of material in little space without losing any of their worth. It contains many fine ideas, procedures and other details not generally found in textbooks and each is handled concisely and brilliantly. Proper tribute is paid the pioneers of the technics quoted. To save the reader time, most technical procedures have been presented pictorially, yet the written accounts leave nothing to the imagination, thereby preventing confusion. Methods of choice are discussed freely, and reasons are given why the editor has chosen these procedures above others, as based on physiology, pathology, anatomy and related sciences. In fact, the book covers almost every phase and aspect of hospital routine, both for elective and emergency surgery, so that no detail of the work which may fall on intern or resident or senior house staff has been omitted. The book may be considered a gold mine of ideas, giving emphasis to the factors which make for diagnostic accuracy and are an aid not only to the student, but to the general practitioner as well. As a quick reference work one would have to look far to find one that surpasses this new edition of an old standby.

A Manual of Fractures and Dislocations. By Barbara Bartlett Stimson, Ed. 2, Philadelphia, Lea & Febiger, 1947. The book is abundantly illustrated with line drawings. No reproductions of x-rays are used. The principles of fractures and dislocations are emphasized and methods which the author has found useful in applying these basic principles are clearly and concisely described. One of the large merits of the doctor's publication is its brevity. The author has divided her work into 21 chapters, using a single chapter to describe the injuries of one particular portion of the anatomy of the body. This simplifies presentation of the work. The author's references are few and her index is adequate. The book would be an excellent one for students to use.

Principles of Occupational Therapy. By Helen S. Willard and Clare S. Spackman, Philadelphia, J. B. Lippincott Company, 1947, 416 pp. The work, the combined result of the efforts of 20 contributors, is divided into two sections which contain 14 chapters. Many forms for keeping records are illustrated. I think the book would be greatly enhanced if it contained more photographic illustrations of types of patients and types of treatment. It is indeed complete with considerable information concerning many of the occupational therapy procedures that have been developed before and during World War II. It would be a very handy book for the shelf of every doctor, nurse, and social worker. It has an excellent chapter on the treatment of paraplegics, and also a chapter on reduction of amputees.

History of the American Medical Association. By Morris Fishbein, Philadelphia, W. B. Saunders Co., 1947. The author-editor and his coauthors are to be congratulated upon having gathered together an encyclopedic array of data of the American Medical Association's first century, in honor of which it was published. The rise of the Association as a great organization covers a period of unsurpassed progress in the Science and Art of Medicine.

In this well written, very readable history the practicing physicians of America will find brief sketches of leaders in American medicine as well as of many of their friends and teachers. The book also will appeal to a lay audience. Fielding Garrison would have been delighted with the book and it is unfortunate that he could not have been living and among the coauthors.

In its growth and development the American Medical Association has kept pace with unparalleled discoveries and developments in the diagnosis and prevention of disease—discovery of bacteria as the cause of disease, the rise of preventive medicine and public health, discovery of new drugs, etc. Naturally, this volume emphasizes the campaigns to raise the standards of medical education, to combat quackery, nostrums and frauds in the medical field, to improve industrial health, and to provide a wide distribution of a high quality of medical care. The inclusion of the histories of the Councils, Bureaus, and publications of the American Medical Association is a unique stroke and has greatly enhanced the value of the book.

The book should also prove to be a convenient reference for doctors active in medical organization.

On the whole the volume is a fine accomplishment and certainly is a brilliant story of medical advancement which sets a high standard for the second century of American medicine to equal and if possible surpass.

History of the Medical Society of the County of Westchester, 1797–1947. Published by the Medical Society of Westchester County, 1947, pp. 193. The history of the Medical Society of Westchester County, the first one to be organized in the state of New York, takes you back 200 years when doctors had no hospital facilities, laboratory technic, aseptic surgery, bacteriology, stethoscope, hypodermic needles, ophthalmoscope, microscope or clinical thermometer. It is the story of earnest medical men of commanding vision. Anyone interested in the history of medicine in general would enjoy reading it through. One will find in it interesting references to incidents in medical practice in the early days. For example, the case of a woman with globus hystericus who was later found to have swallowed her plate of false gold teeth, 2½ inches long and ¾ inches wide with two clasps. The attending doctor notes, "I then prepared a probang with forceps attached in order to extract it if possible from the stomach, but the patient on viewing the improvised instrument declined the operation and the lady up to the time of report has experienced no ill effect."

History of Medicine, by Cecilia C. Mettler, Philadelphia, The Blakiston Company, 1947, 1215 pp. This scholarly volume, edited posthumously by Dr. Fred A. Mettler, represents more than nine years of indefatigable research, meticulous translation of literally thousands of original sources, and scrupulous literary honesty on the part of the author. The work can justly be valued not only as a trustworthy source of information by the librarian, student, editor or researcher, but also for its intrinsic interest and literary merit by the reader interested in the development of the medical sciences.

The arrangement of the subject matter is unique. Each subject, covered in the Standard Medical Curriculum, is followed through from its earliest historical beginnings to the end of the nineteenth century. This has its aspect of usefulness for the student and research worker, or for the reader interested in one particular subject. It has its disadvantages for the reader who likes to study the parallel development of the several branches of a science or who prefers to gain the picture of a setting or background. This is inevitable. One can't have it both ways.

The volume takes up in order Anatomy and Physiology, Pharmacology, Pathology and Bacteriology, Physical Diagnosis, Medicine, Neurology and Psychiatry, Venereology, Dermatology, Pediatrics, Surgery, Obstetrics and Gynecology, Ophthalmology, Otology and Rhinolaryngology.

Mention should be made of the attractive end pages. They map the sources and transmission routes of medical tradition from the earliest Asiatic foci to Edinburgh.

The type, though small for good reason, is clear, and the double columns make for easy reading. Those who find in footnotes the sauce of scholarship will be happy among these pages.

This book inevitably will find its way into every library which maintains a well-stocked shelf of reference books. It can also be recommended without reservation to every person in or out of the medical profession who is interested in the past history of the art and science of medicine and its branches.

Sexual Behavior in the Human Male, by Alfred C. Kinsey, Wandell B. Pomeroy and Clyde E. Martin, Philadelphia, W. B. Saunders Co., 1947. This book is the first volume of a proposed total of at least nine dealing with all phases of the sexual behavior of the American people. Alfred C. Kinsey, the senior author, has approached the subject from the point of view of a biologist (which is his position at the University of Indiana) in collecting data and presenting them as a catalogue of statistics. Thus far, he and his associates have spent nine years in personally interviewing 12,000 persons and expect to carry on their work until at least 100,000 subjects have been studied. They estimate that 20 years will be necessary to complete the study and by that time enough facts regarding human sexual behavior will have been accumulated to perhaps make us more cognizant of the actual sex behavior instead of the hoped for behavior.

This first book represents statistics on 5,000 white males. Because of the difference in economic and social background a separate study of the behavior of negroes is contemplated. Although this is only a small proportion of the proposed total, it is apparent that enough facts have been gathered to show trends, "expose" problems hitherto unnoticed, and to provide a basis for the discovery of important truths upon which all scientific thinking is based. It is the first such massive factual study ever

made but is written in a manner so interesting that the reader is unaware of the truly scientific nature of the work.

Most of the criticisms of the book have questioned the validity of the statistics, saying that the subjects could not be expected to remember many of their experiences and that some would attempt to brag about theirs. Be that as it may, the subjects are only human and Kinsey has taken that factor into consideration in the form of the questions and the manner in which they were presented.

The statistics have been arranged in three main groups; social level, educational level, and occupational level. Reference is continually made to "upper" and "lower" classes, the former being an educational attainment of more than 13 years of schooling and an occupational class (ranging from 1—laborer to 9—extremely wealthy) of 7 which is the professional class. The "lower" level refers to an education consisting of less than 8 years with other groups falling between these extremes.

The differences in mores between upper and lower social level groups are reflected in the striking differences in sexual behavior between those groups.

That much of the sexual behavior follows religious, moral and cultural training is shown by Kinsey in his statistics on various phases and aspects of sexual experience and the effect of restraint on the various levels.

It is not the purpose of this review to present the multitude of interesting and previously unknown facts about our sexual behavior. That can be obtained only through reading the book. The fact that it has approached best-seller proportions even at the price of $6.50 points to the interest the public has in the subject if only for the purpose of rationalization of one's own behavior and to see how one compares to others on this usually taboo subject.

For the professional group the reading of "Sexual Behavior in the Human Male" is indispensable. It gives the "upper level" group a better understanding of the behavior of the "lower level" group where counselling, venereal disease control, sex crimes, and illegitimate births are vital problems.

Kinsey's study is an excellent work in a field where few facts have previously been attained because of social taboos, ignorance, and prejudice, and the scientific world eagerly awaits the publication of his forthcoming volumes.

Actions of Radiations on Living Cells, by D. W. Lea, New York, The Macmillan Company, and University Press, Cambridge, 1947, 402 pp. This book is recommended to those interested in a clear and well written treatise on the fundamental actions of ionizing radiations and x-rays on living cells. The early chapters describe the important chemical effects and pertinent relating physical properties that such ionizing radiations have upon living matter. A large portion concerns itself with a dissertation on the effects of such radiation phenomena upon viruses, genes or chromosomes of some of the more highly organized and complex-living cells. The last chapter presents a valuable and lucid description of the mechanism whereby cells are killed by the effects of such radiation agents.

As one reads this book, one is impressed with the painstaking effort made by the author to present the subject matter in a clear and concise manner, written primarily for those of us whose grounding in mathematics may be somewhat elementary in respect to advanced physics and calculus. After a careful reading of the contents of the various chapters, studying its explanatory charts and graphs, as well as an appendix containing supplementary calculations, and an extensive bibliography, the reader is impressed with the great basic value of this new book. It can be highly recommended to those interested in the fields of x-ray, radiation therapy or in fundamental nuclear physical research.

This book will prove to be of major importance for investigators in the broad fields of biology, gynetics and medicine.

Benjamin Silliman, Pathfinder in American Science, by John F. Fulton and Elizabeth H. Thomson, New York, Henry Schuman, 1947. It is well for Americans to study the life of this founder of American scientific teaching. One learns quickly that Benjamin Silliman, while a devoted teacher, did not spend all of his time in the cloistered shelter of Yale College. Instead, he visited, communed, and corresponded with all men of science in whatever country they resided. He participated vigorously in the affairs of the country which deeply affected his convictions (viz: the Civil War). While his original discoveries were limited, his surveys and teachings led to the founding of such native industries as coal and petroleum.

The authors have pictured a sober, God-fearing scientist who permitted little inner conflict between the laws of science and God. This is and was a conflict which many great minds have had difficulty in resolving. One has the feeling that there were more facets to Silliman's personality than the

authors portray. In his youth, he seems to have enjoyed good food, drink, and the company of a pretty girl. One feels that "sober Ben" enjoyed his life. The too *sober* account set forth in this volume is dry reading. No one should write a dull book about a bright life.

Gynecology With a Section on Female Urology, by Lawrence R. Wharton, Philadelphia, W. B. Saunders Co., 1947. This is one of the best textbooks on gynecology. Few changes have been made in the second edition, but not many were needed because the first edition was all that could be desired. As in the previous edition, a large number of the illustrations were borrowed from other authors but since many of these drawings were made by Max Broedel and other highly capable artists, and are unsurpassable for beauty and clarity, no one can object to their presence in Wharton's book.

The book covers the entire subject of gynecology and urology in the female. In the latter section of about 230 pages there is now a chapter on Water Cystoscopy. This is an innovation because at Johns Hopkins since 1893 the Kelly air method of cystoscopy has been used.

The author has included in this edition all of the recent advances made in gynecology and of course he mentions the use of the new antibiotics wherever they have a field of usefulness. The advice given concerning treatment is conservative and in agreement with that of the leading gynecologists. The amount of useful data presented is enormous. The book is well written, the type is clear, and the paper is good; hence it is a pleasure to compliment both the author and the publisher for this excellent book. It should prove most helpful to all medical students and general practitioners and also to specialists in gynecology.

Nursing. By Lulu K. Wolf, New York, D. Appleton-Century Co., Inc., 1947. This book is intended for the first year student of nursing and as such it should fulfill its mission though its purpose probably will have to be fortified by direct teaching. For example, it should be valuable to the prospective nurse to be so well informed regarding the laws and other developments which have had such a vital bearing on the nursing profession, especially within comparatively recent years. It is highly doubtful, however, that the first-year student will read these preliminary chapters as attentively as she should unless lectures support the reading.

The elementary technics, as outlined, are appropriate to the grade in nursing school for which they are intended and the illustrations are clear and helpful. Mild criticism may, however, be offered on points here and there.

The uncritical use of the word "patient," for instance, in the heading, "Preparing the Patient for the Morgue." We are aware that the words "patient" and "ease" too often are used carelessly in medical literature, and that the abstract term "ease" is used where the specific "patient" is meant. But we would like to suggest that when a patient has reached the condition where he is being prepared for the morgue he is no longer a patient but a body. A similar uncritical use of terms occurs where obstetric nursing is discussed. It seems somewhat inconsistent to state that "maternity *is* a physiologic process rather than a disease" while pointing out that "maternal and neonatal mortality is high." It is well enough to teach the promotion of health of mother and child, but some mention should be made of the fact that there are premature babies, contracted pelves, malpresentations, not to mention heart disease, hyperthyroidism, diabetes, toxemia, and so on, complicating pregnancy and requiring specialized technics which the student must learn eventually, if not in her own school then in an affiliate or as an exchange student. Granted that this is a book for beginners. Still, the student might be told that pregnancy *should be*—not *is*—a physiologic process but that clinical and obstetrical conditions keep the mortality and morbidity rates high.

English-Spanish Chemical and Medical Dictionary, Comprising Terms Employed in Medicine, Surgery, Dentistry, Veterinary Science, Biochemistry, Biology, Pharmacy and Allied Sciences and Related Scientific Equipment. By Morris Goldberg, New York, McGraw-Hill Book Co., 1947. This book fills a long-felt need. Technical foreign language dictionaries are available, but in largest measure they devote their definitions to terms used in engineering and the physical sciences. Therefore, a dictionary which gives terms used in medicine, surgery, biologic and allied sciences is of great value to editors and students as well as professional people in these fields whose work entails contact with our South American neighbors. The value of the dictionary would have been greatly enhanced had definitions been given in English as well as in Spanish. To the reader or editor of Spanish manuscripts, letters, etc., the present dictionary is of no great help. It is to be hoped that the publishers will consider such an extension of the present volume in future editions.

Abstracts from Current Literature

A Comparative Study of the Action of Demerol and Opium Alkaloids in Relation to Biliary Spasm, E. A. Gaensler, J. M. McGowan, and F. F. Henderson, Surgery, **23**:211, Feb. 1948. While the spasmolytic action of demerol has been demonstrated experimentally, there have been few studies in man to substantiate the expected relaxing effect on intestinal and urinary tract. In a previous study by J. M. McGowan and co-authors measurement of pressure changes in the common bile duct showed that spasm of the muscle of the second portion of the duodenum occluded the lower end of the common bile duct with a sphincterlike action. It was concluded that while the sphincter of Oddi may exist as a separate entity its function is physiologically synchronous with that of musculature of the second portion of the duodenal wall. For this reason the term, duodenal spasm, refers to spasm of the sphincter mechanism of the biliary tract (sphincter of Oddi). It was found that spasm of the second portion of the duodenum was produced by codeine, dilaudid, pantopon and morphine. This spasm caused enough back pressure in the biliary tract, in some cases, to produce an attack of biliary colic. The nitrite drugs, aminophylline and epinephrine, relaxed this spasm. This same method of pressure studies has been found useful in determining the optimum time for removal of the T-tube.

The present pressure studies revealed that demerol is spasmogenic, rather than spasmolytic (as heretofore believed) in its effect on the sphincter mechanism at the lower end of the common bile duct (Oddi). In intensity the spasm was intermediate between that produced by codeine and that of morphine, and was sufficiently severe in two cases to produce typical biliary colic. It increased, rather than decreased, natural spasm. The spasm was regularly but briefly relieved by amyl nitrite or theophylline ethylenediamine (aminophylline). Demerol, therefore, should be used with as much caution as the opiates in postcholecystectomy pain.

Carcinoma of the Gallbladder, Report of 75 Cases, F. P. Sainburg and John H. Garlock, Surgery, **23**:201, Feb. 1948. The authors emphasize the importance of gallstones as a predisposing factor in carcinoma of the gallbladder. Since the disease is virtually incurable its occurrence must be prevented. And since the mortality rate of malignant transformation in calculous gallbladders far exceeds the prevailing operative mortality of cholecystectomy, the indication for removal even of asymptomatic calculous gallbladders on this ground alone is obvious. Symptomatically the disease is not recognizable until beyond curability.

Arterial Supply of the Distal Colon Pertinent to Abdominoperineal Proctosigmoidectomy, with Preservation of the Sphincter Mechanism, Harry E. Bacon and Caleb H. Smith, Ann. Surg. **127**:28, Jan. 1948. The experience of the authors with abdominoperineal proctosigmoidectomy with preservation of the sphincter mechanism in 264 cases may be considered a method of study of the arteries to the sigmoid and upper rectum. As such, it can be integrated with the experimental anatomic studies. Their studies of 264 cases at operation confirm the recommendation of both Sudeck and Hartmann that it is wise in each patient to observe the arterial pattern of the inferior mesenteric artery and its branches. In maintaining adequate blood flow to the rectum when the superior hemorrhoidal artery had to be ligated, the origin of the lowest sigmoidal artery became known as the critical point of Sudeck. In the technic of abdominoperineal sigmoidectomy with preservation of the sphincters, the last sigmoidal artery may be disregarded. The superior hemorrhoidal artery cannot be ligated below the origin of this vessel and allow sufficient mobility of the bowel to permit its being brought down to the anus without tension. As a corollary, it is impossible in performing this operation to clamp the superior hemorrhoidal artery at the critical point of Sudeck. In their operative experience the authors, by simple precautions, have been able to segregate those cases in which ligation may be made safely between the lowest two sigmoidal arteries from those in which ligation must be performed higher than the second lowest sigmoidal artery to assure viability. Chief among these precautionary measures has been transillumination of the mesentery before and after ligation of the inferior mesenteric artery. On the basis of anatomic studies, if there is any doubt regarding the adequacy of the blood supply to the colostomy loop, ligation need be done only above the second sigmoidal artery to insure sufficient blood flow. In an end-to-end anastomosis after resection of the sigmoid viability of each end must be assured. The critical point is most significant in this operation. It need hardly be considered in abdominoperineal procto-

sigmoidectomy with preservation of the sphincter mechanism. Here, ligation of the inferior mesenteric artery must be performed above the lowest sigmoidal artery at least to permit the mobility of the colon necessary to bringing it to the anus. The inferior mesenteric artery may be deliberately ligated much more proximally in cases where more of the upward lymphatic pathway is to be removed or where one is not completely satisfied with the competency of the circulation to that part of the bowel to be brought to the anus. In the average case the authors have agreed with Drummond that the most convenient place to ligate the inferior mesenteric artery is immediately below the first sigmoidal branch, which can be recognized by the large anastomotic branch it forms with the left colic artery.

One-Stage Resection and Anastomosis of the Colon, Utilizing the Furniss Clamp, J. W. Hinton and S. A. Localio, Ann. Surg. **127**:12, Jan. 1948. A series of 26 consecutive colonic resections, covering all regions of the colon above the peritoneal reflection, were done in one stage without a proximal colostomy or ileostomy, and anastomosed aseptically with the Furniss clamp, with a mortality of 3.8 per cent. Nonobstructed cases are selected for the procedure, and adequate preoperative and postoperative treatment and attention to details are essential to success. Five to seven days are allowed for preoperative preparation, with correction of fluid and electrolyte balance, anemia, hypoproteinemia and vitamin deficiencies. Succinylsulfathiazole is administered throughout the period. At operation the colon is found collapsed and free from fecal material.

The resection must be performed so that an adequate blood supply is available to the severed ends which will be opposed. Sealing of an anastomosis occurs by serosal union, hence excess fat and appendices epiploicae in the proposed line of suture are carefully removed before the clamp is applied. The bowel is rotated 90 degrees, the medial surfaces are opposed and held with Allis clamps. The Furniss clamp is applied and locked, the pin passed across the segment to be sacrificed, and the colon is resected flush with the Furniss clamp, using a knife moistened with pure carbolic acid; excess carbolic acid is removed with alcohol. Stay sutures are placed at the mesenteric and antimesenteric borders and the clamps removed. A single row of anterior cotton Lembert sutures is placed, the intestine is rotated, a posterior row of similar sutures is placed, and the pin is removed. A second row of interrupted cotton Lembert sutures is placed and the mesentery repaired. The diaphragm that has been formed by the clamp is opened by manipulation with thumb and forefinger. Sutures are placed down to, but not through, the mucosa. Interrupted fine cotton sutures are chosen for anastomosis and for closure of abdominal wall. Drainage has been found unnecessary.

In postoperative care, blood transfusion, Levin tube without suction, infusions of amigen and glucose plus additional glucose in distilled water to prevent salt retention, are important. When gas is passed by rectum the Levin tube is removed, parenteral feeding is discontinued gradually and oral feeding gradually liberalized; low residue foods are retained by the third day. Rectal tubes, enemas and catharties are avoided. As a rule the bowels move spontaneously between the third and fifth days, though occasionally glycerin suppositories may be required. All patients are ambulated on the first postoperative day and daily thereafter. All are urged to use bathroom facilities rather than the bed pan. Succinylsulfathiazole is used postoperatively.

Massive Resection of the Small Intestine, H. D. Cogswell, Ann. Surg., **127**:377, Feb. 1948. A case is reported in which after resection of 80 per cent of the small intestine, 14 inches (35 cm.) of the jejunum remained, with survival of the patient. Postoperative diagnosis was arterial embolism of the superior mesenteric artery with gangrene of the greater portion of the small intestine. The patient manifested the same symptoms and findings of other reported cases, namely, poor fat digestion with frequent fatty stools associated with low cholesterol and deficient calcium absorption. The proteins and carbohydrates were well metabolized. Postoperatively there was a good response to a high protein, high carbohydrate, low fat diet augmented by oral calcium and vitamin D.

Roentgenologic Examination of the Small Intestine, C. Allen Good and M. Elizabeth H. Fletcher, J. M. Assoc. Georgia, **38**:67, Mar. 1948. The symptom complex of tumors of the small intestine is characterized by various forms of gastrointestinal bleeding, or by mass in the abdomen. The diagnostic accuracy of roentgenologic examination of the small intestine is highest in regional enteritis, fairly high in benign and malignant tumor, and lowest in cases of Meckel's diverticulum. While the examination will not yield the high percentage of accurate diagnosis attained from roentgenologic examinations of the stomach and colon, nevertheless, when properly done, the diagnostic yield is sufficiently large to warrant its use whenever a lesion of the small intestine is suspected.